

# METAL FINISHING

REPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

COPYRIGHT DEPOSIT.

## STAPLBOND SECTIONS AND BRUSH WHEELS *for both* WET *and* DRY OPERATIONS



An exclusive H-VW-M method of fastening specially developed fibre center covers with hard tinned steel wire staples eliminates warping and splitting.

When brush wheels are more convenient than the use of sections, such wheels are available in various diameters and widths of face. This is an ideal product for burring operations.

STAPLBOND TAMPICO BRUSHES are produced in both sections and wheels and made from selected white tampico, the fibres being evenly distributed and locked in place. This product insures

efficient performance with emery paste and other compositions as well as for various wet operations. Available in diameters from 6 to 16 inches.

STAPLBOND STEEL WIRE BRUSHES are also produced as sections and wheels and are recommended for cleaning and heavy brushing operations on metals and various hard rubber and plastic products. They are available in diameters from 6 to 16 inches and made of crimped high carbon steel wire securely held in place. These brushes are available in various standard gages of wire.

PLATING & FINISHING  
HEADQUARTERS

Since 1820



MAY 17 1963

# CLEPO TETRA-DIP PROCESS

## Aluminum Treatment

DESIGNED FOR USE PRIOR TO  
ELECTROSTATIC SPOT WELDING  
ELECTROMAGNETIC SPOT WELDING  
A. C. SPOT WELDING

*The efficiency of the "Clepo Tetra-Dip Process"  
is shown by the following tables:*

SHEAR TEST TABLE FOR 032" METAL

ALLOY.	TETRA-DIPPED SPECIMENS.	GOV'T. SPEC
2 S	230#	150#
3 S	324#	210#
24 S ALCLAD.	482#	270#
52 S	497#	300#

PARTS CLEANED IN CLEPO TETRA  
DIP PROCESS WHEN SPOT WELDED  
AND SHEAR TESTED GIVE VALUES  
EXCEEDING GOV'T. SPECIFICATIONS

CONTACT YOUR LOCAL **CLEPO**  
SERVICE MAN FOR DEMONSTRATION

ELECTRICAL RESISTANCE TABLE.

ALLOY.	1 HOUR AFTER TETRA-DIPPING	3 WEEKS. AFTER TETRA-DIPPING
2 S	40 MICROHMS	48 MICROHMS
3 S	38 MICROHMS	49 MICROHMS
24 S ALCLAD.	39 MICROHMS	50 MICROHMS
52 S	41 MICROHMS	49 MICROHMS

PARTS CLEANED IN CLEPO TETRA  
DIP PROCESS GIVE ELECTRICAL  
RESISTANCE TEST VALUES UNI-  
FORMLY LESS THAN 50 MICROHMS

FREDERICK GUMM CHEMICAL CO.  
• INC. •

538-542 FOREST STREET • KEARNY, N. J.



# Spring Life

## DEPENDS UPON CORROSION PROTECTION WITHOUT HYDROGEN EMBRITTLEMENT

Upon just such springs as this depends the success of a machine of war. The life of this spring, in turn, is protected and lengthened by treatment with Ebonol "S".

Ebonol "S" is being used on a host of war products — ball bearings, pinions, gears, guns, bombs, propellers, etc., because the finish is hard, adherent, tough, wear resisting, friction reducing, corrosion protecting and black.

The Ebonol "S" process is selected because it is simple to control and operate, economical, and the most pleasant blackening process to operate.

Enthone engineers are college trained chemists and metallurgists with years of practical plant experience to serve you better.



IT'S EBONOL-IZED

## Other Blackening Processes for War Plant Needs

Ebonol "C" for Copper, Brass and Bronze

Ebonol "Z" for Zinc Plate and Zinc Alloys

Ebonol "A" for Aluminum and its Alloys

THE **ENTHONE** CO. NEW HAVEN  
CONNECTICUT

Chicago  
GEORGE A. STUTZ  
MFG. CO.  
1641 Carroll Ave.  
Chicago

Detroit  
FREDERIC B. STEVENS,  
INC.  
Larned & 3rd Sts.  
Detroit

Newark  
THE PLATING  
PRODUCTS CO.  
352 Mulberry St.  
Newark, N. J.

New York  
SPECIAL CHEMICALS  
CO.  
30 Irving Place  
New York



# You tap a NEW source of production efficiency when you **DEGREASE** AND **CLEAN** your war products the **FAST OAKITE WAY!**

IN PREPARING ordnance and other war supplies for plating, lacquering, painting or black oxide finishing ... or for anodizing, galvanizing, the Bullard-Dunn Descaling Process or Dow surface treatments ... specialized Oakite alkaline, emulsifying, acid and solvent-type cleaning materials help you tap a NEW source of production efficiency!

Used in automatic machines or tanks, these dependable materials keep production UP and rejects DOWN by thoroughly, speedily removing oil, grease, smut, soldering fluxes, polishing and buffing compounds, identification paint...put parts in the CHEM-

CALLY CLEAN condition that wartime QUALITY finishing operations demand! See list below for types of war products on which Oakite materials are being specified and used by prime and sub-contractors.

## Oakite Technical Service FREE!

Whether or not you use Oakite materials, ALL our facilities ... our Nation-Wide Field Service Staff, our Technical Laboratories, our 34 years' experience ... are FREELY AVAILABLE to expedite and speed-up your production cleaning operations. Your inquiries invited ... and promptly answered.

## IS THE WAR SUPPLY ITEM YOU ARE PRODUCING LISTED HERE?

A wide range of specialized Oakite materials is available to meet every production degreasing or cleaning specification on war orders. Warehouse stocks maintained in key industrial centers.

AIRPLANES  
AIRPLANE MOTORS  
FLIGHT INSTRUMENTS  
AIRPLANE PARTS  
BOMB FIN ASSEMBLIES  
BOOSTER CAPS  
FUZES & FUZE PARTS

POWDER BOXES  
CARTRIDGE CASES  
SHELLS  
SHELL CASES  
FLARE BOMB CASES  
DEMOLITION BOMBS  
INCENDIARY BOMBS

PRACTICE BOMBS  
GRENADES  
LAND MINES  
FIRE-CONTROL INSTRUMENTS  
COMMUNICATION EQUIPMENT  
RIFLES  
SMALL ARMS AMMUNITION

GUN PARTS  
MACHINE GUN MOUNTS  
ANTI-AIRCRAFT GUNS  
TRENCH MORTARS  
HOWITZERS  
MOTORCYCLES  
MOTOR SCOOTERS

SCOUT CARS  
TANKS  
TRACTORS  
TRANSPORT TRUCKS  
GAS MASKS  
HELMETS  
ETC.

Manufactured only by  
**OAKITE PRODUCTS, INC., 18 Thames Street, NEW YORK, N. Y.**  
Technical Service Representatives in All Principal Cities of the United States and Canada

# OAKITE

MATERIALS...METHODS...SERVICE

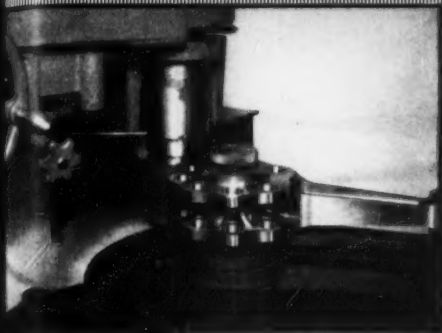


# CLEANING

FOR EVERY CLEANING REQUIREMENT

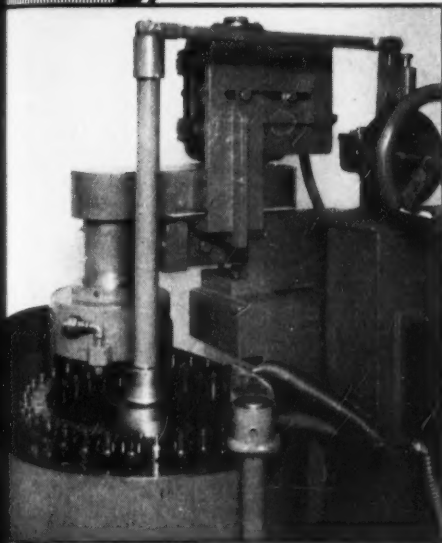
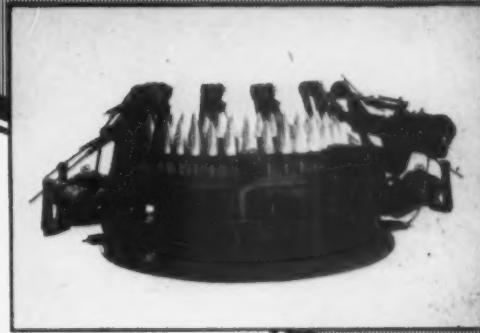


# *Solving the Man-Power Shortage* in **POLISHING..BUFFING..** **WIRE BRUSHING..BURRING**



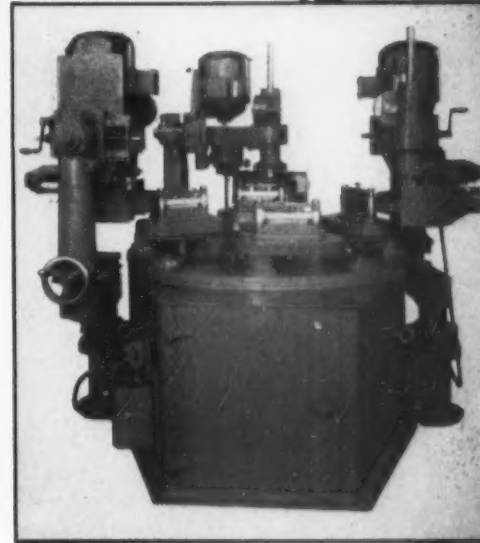
*Special Acme Machine for polishing engine parts.*

*Special Acme Machine with 8 belt heads — for polishing tapered cylindrical parts. Multiplies daily production, with greatly reduced man-power.*



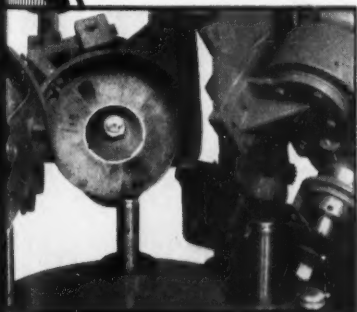
*Special Acme Machine for grinding small mechanical parts—2000 per hour. Automatic wheel feed. Automatic diamond dresser. Automatic unloading.*

**Keep  
Production Up  
BY USING  
ACME  
AUTOMATICS  
And Spreading  
Your Man-Power!**



*Special Acme Machine for blending the radius in washers—1200 to 1500 operations per hour.*

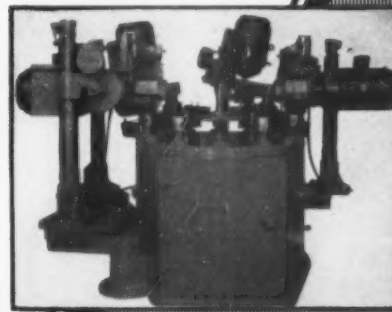
*Special Acme Machine for polishing and oiling aircraft parts.*



*Acme Rotary Machine for polishing, buffing and wire-brushing. Big savings in man hours.*



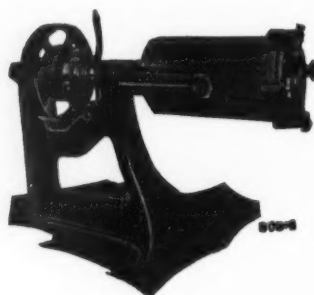
*Special Acme Machine for finishing pistons. Constructed to finish valve recess and avoid sluff marks.*



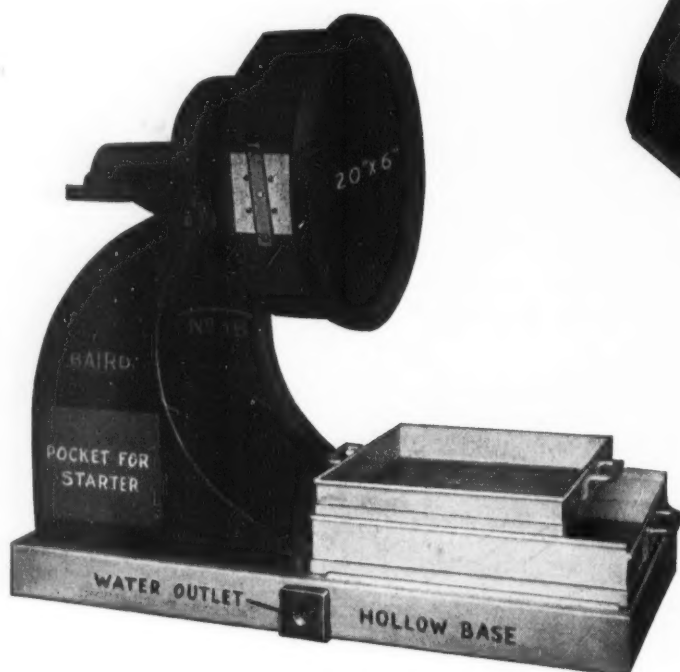
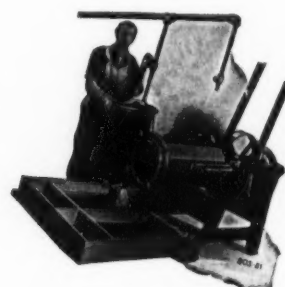
**ACME Manufacturing Co.**  
1642 HOWARD ST. • DETROIT, MICH.  
*Builders* OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 25 YEARS



**HORIZONTAL BARRELS**



**TILTING BALL BURNISHING BARRELS**



This shows a High and Narrow Type of Barrel mounted on "Baird" Model D. or Pedestal Type Motor driven Oblique Tilting Tumbler.

As shown the barrel was lined for use for burnishing with hardened steel balls.

These barrels may be of any suitable material depending on the job. Cast iron or fabricated steel unlined or lined with rubber etc. for rolling in abrasives.

Made in 20" dia. x 6" for No. 1 Tumbler

Made in 24" dia. x 8" for No. 2 Tumbler



This shows the side of a No. 1 BAIRD Model D. Single Oblique Tilting Tumbler with a No. 22 Sheet Steel Polygonal Barrel and with an Automatic Electrical Tilting Device.

This device AFFORDS GREATEST SAFETY—LEAST LABOR—LEAST FLOOR SPACE—LEAST AMOUNT OF DISTANCE TO MOVE WORK in USING the tumbling barrels. SAVES TIME AND FLOOR SPACE.

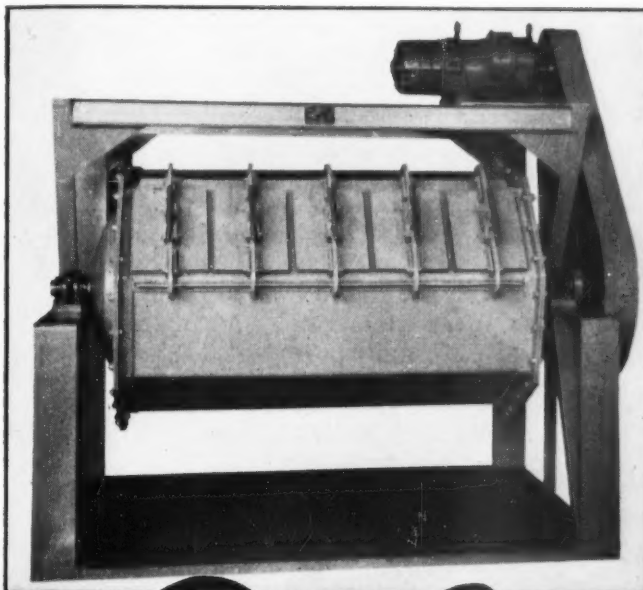
**When tumbling questions come up "ASK BAIRD ABOUT IT"**

**THE BAIRD MACHINE COMPANY**

**STRATFORD, CONNECTICUT**

Since 1846 specializing in high production machinery for articles of wire and for ribbon metal. Also machines to turn, bore, etc., castings, forgings, etc., up to 10½" diameter.





**It's-PROVEN  
PRACTICAL  
ECONOMICAL  
READY!**

# *Roto-Finish*

*For Mechanically*  
**DEBURRING  
BUFFING  
GRINDING  
HONING  
POLISHING**

**STEEL • BRASS • ALUMINUM • STAINLESS or NICKEL STEEL  
MACHINE PRODUCTS • TURRET LATHE PRODUCTS • MILLING  
MACHINE PRODUCTS • STAMPINGS and CASTINGS  
DIE CASTINGS and DROP FORGINGS**

On  
Parts for  
**AIRPLANE ENGINES  
MACHINE GUNS  
TANKS  
PROPELLER BLADES  
ALUMINUM  
CASTINGS  
and Other War  
Production Parts**

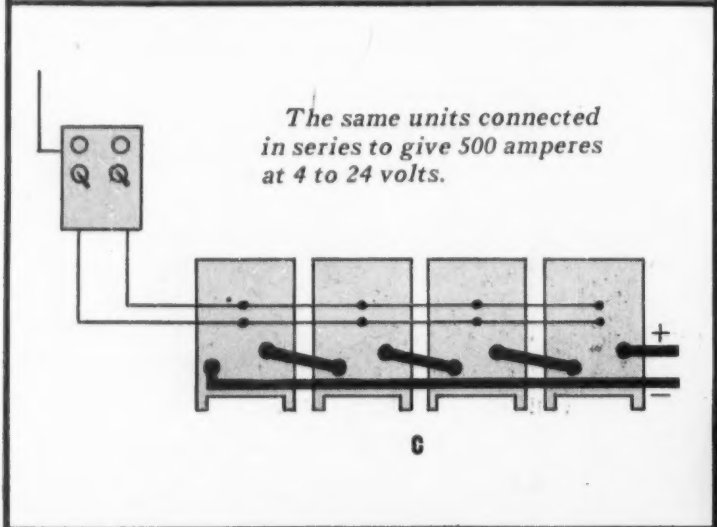
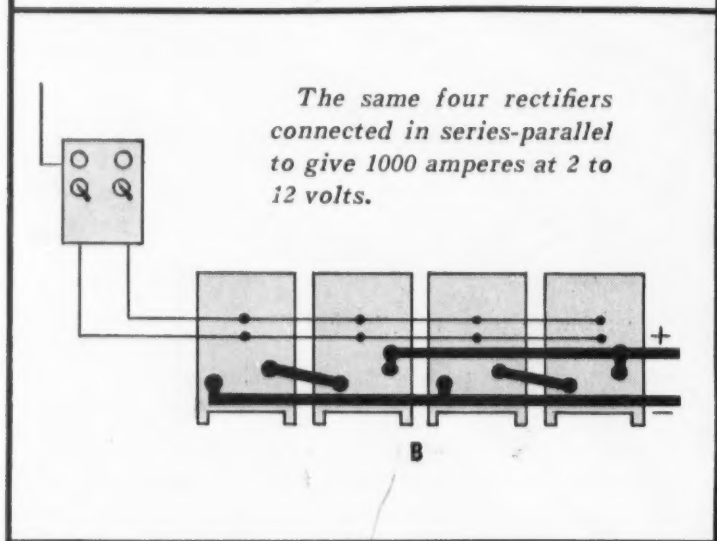
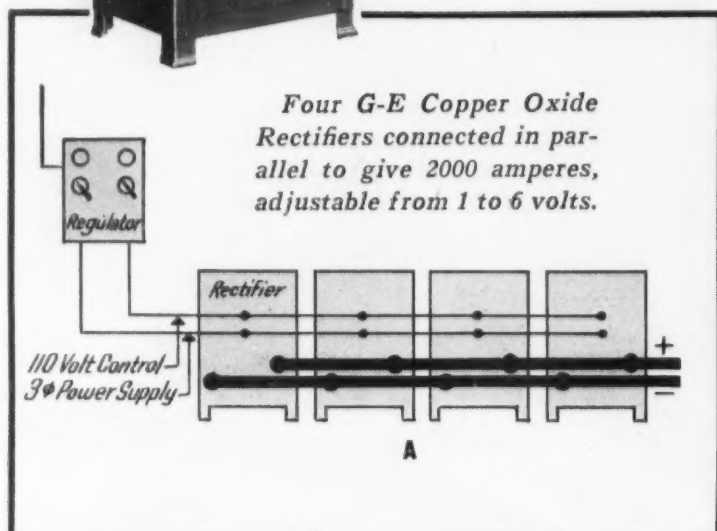
*Effective and  
Practical — both  
for War Produc-  
tion, and Peace  
Time Use—  
Write for illus-  
trated folder  
describing Roto-  
Finish and how  
it can increase  
your production*

**STURGIS PRODUCTS CO.**

**STURGIS • MICHIGAN**



# ONE TOOL FOR MANY JOBS



How one electroplater adapted General Electric Copper Oxide Rectifiers for various jobs, including still-tank plating, barrel plating and anodizing

## A. 6-VOLT TANK PLATING

By connecting four G-E Copper Oxide Rectifiers in parallel, the plater obtained 2000 amperes at from 1 to 6 volts for a still-tank plating job. The single regulator for the four units gave complete control over the full range output.

## B. 12-VOLT BARREL PLATING

When a barrel-plating contract was obtained, it was a simple matter to rearrange the four rectifiers in series-parallel so as to secure 1000 amperes at from 2 to 12 volts required for the job.

## C. ANODIZING

The same four rectifiers were also reconnected in series for an anodizing job requiring 500 amperes at 4 to 24 volts.

## OTHER COMBINATIONS

These are only three common examples of the wide variety of groupings that can be obtained with G-E Copper Oxide Rectifiers to serve specific needs, including 40 volt anodizing.

Why not investigate the potential uses of G-E Copper Oxide Rectifiers in your electroplating? G-E Tungar and Metallic Rectifier engineers will be glad to consult with you. Write to Section A-534-75, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

**GENERAL ELECTRIC**



# PLATING & POLISHING EQUIPMENT

**RELiance**  
PLATING &  
POLISHING  
EQUIPMENT

BUFFS  
BRUSHES  
CHEMICALS  
BUFFING COMPOSITIONS  
PLATING MACHINERY  
Cathodes, Generators,  
Plating and Burnishing  
Barrels, Automatic  
Buffing Machines

Chas. F. L'Hommédieu & Sons Co.  
MANUFACTURERS  
Plating and Polishing Machinery  
Complete Plating Plants Installed  
For Sale and Rent  
4521 Ogden Ave.  
CHICAGO

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The  
RELiance  
Line

## Chas. F. L'Hommédieu & Sons Co.

MANUFACTURERS of  
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**CHICAGO**

Branches:  
Cleveland  
and  
Los Angeles



# DARCO'S

## Dragnet Picks Up Plating Solution Saboteurs

Grease, oil, soap, colloidal impurities and decomposition products can't slip past Darco activated carbon. Darco acts as an effective barrier. Darco removes them from the solution by *adsorption*—before they can reach the plating surface and cause damage.

*Continuous* filtration with Darco gets rid of even traces of impurities. So often, the unnoticed, invisible traces wreck good plating jobs!

Continuous filtration with Darco S-51 has been thoroughly tested by leading plants with complete success—despite heavy schedules. And with continuous purification, Darco permits smaller dosages—impurities have no chance to build up.

Use Darco S-51 as a 24-hour guard on your plating solutions. Enough to keep 100 gallons of solution clean for a week costs only 10 cents.

Insist on the trademarked package. Be sure you specify Darco.

*The article, "Physical Removal of Impurities from Plating Solutions," discusses continuous filtration in detail. Write for a copy.*

DARCO—Reg. U. S. Pat. Off.



This trade-mark identifies the genuine. Accept no packages without it.

# DARCO

## C O R P O R A T I O N

60 East 42nd Street, New York, N. Y.



STEVENS

for  
QUALITY

2

OUTSTANDING  
COMPOSITIONS

*that give*

BETTER-FASTER  
RESULTS

*in the*

DE-BURRING  
*of Parts for*  
WAR PRODUCTION  
JOBS

STEVENS

for  
SERVICE

**STEVENS**  
GREASELESS  
BURRING COMPOUND

1—For removing burrs.

2—For removing tool and grinding marks  
from parts for aircraft engines, machine  
guns, propeller blades, etc.

Produces a semi-bright surface—free from  
grease. Leaves the edges sharp and clean  
cut, and close tolerances can be easily  
maintained.

**STEVENS**  
TAMPICO  
BUFFING COMPOUND

Developed especially for use on Tampico  
wheels and brushes. Hangs well on wheel  
—cleans easily.

Works faster than emery cake or paste  
and reduces wear on the Wheel.

Especially good on surfaces that need but  
little buffing, but where close tolerances  
must be maintained—also where slight  
burrs must be removed without bevelling  
edges.

**FREDERIC B. STEVENS, INC.**

DETROIT, MICHIGAN

New Haven

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Indianapolis

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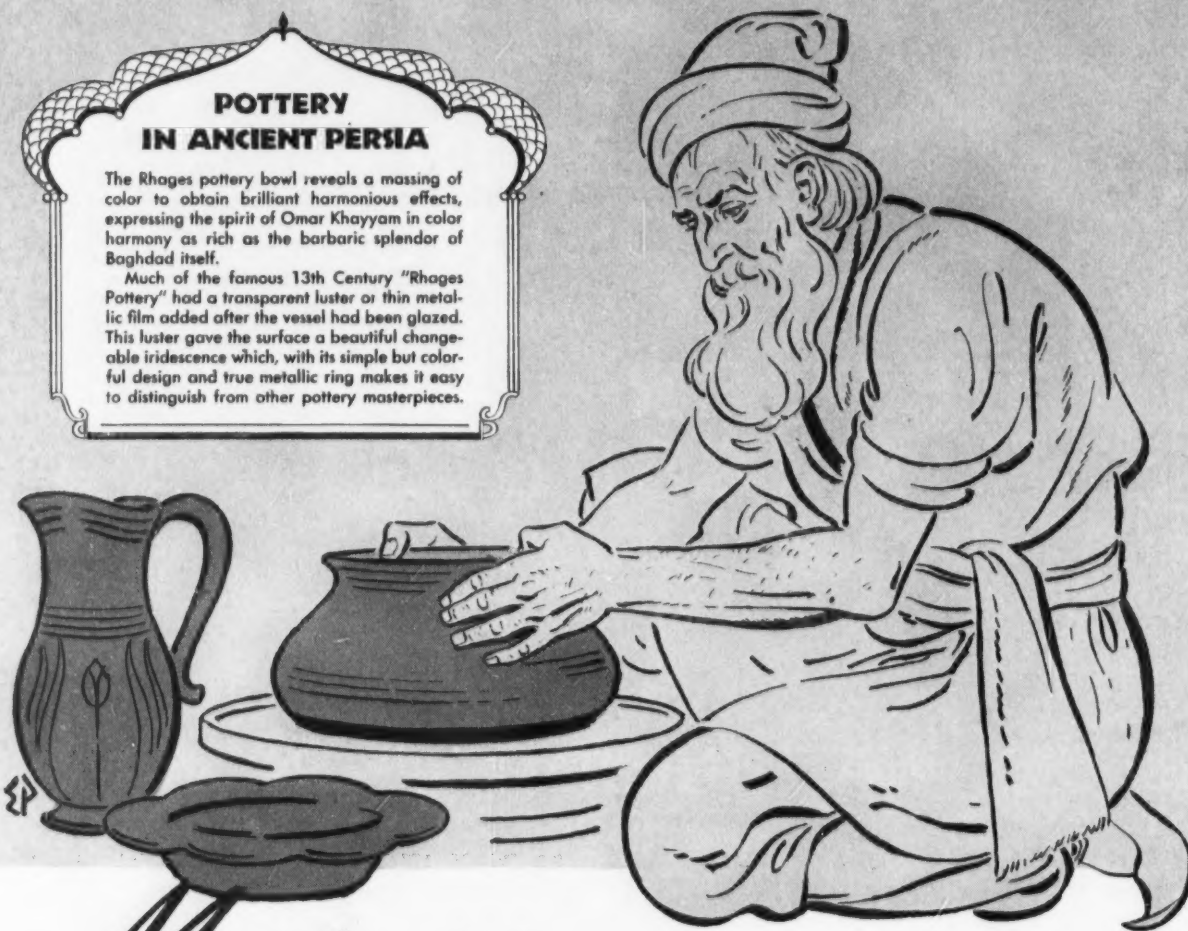
Toronto

"EVERYTHING FOR THE POLISHING AND PLATING PLANT"

### POTTERY IN ANCIENT PERSIA

The Rhages pottery bowl reveals a massing of color to obtain brilliant harmonious effects, expressing the spirit of Omar Khayyam in color harmony as rich as the barbaric splendor of Baghdad itself.

Much of the famous 13th Century "Rhages Pottery" had a transparent luster or thin metallic film added after the vessel had been glazed. This luster gave the surface a beautiful changeable iridescence which, with its simple but colorful design and true metallic ring makes it easy to distinguish from other pottery masterpieces.



## Masterpieces OF POTTERY



FIG. 55  
CONDENSATION  
TOURILL

Like Persian masterpieces of pottery, General Ceramics Chemical Stoneware, when tapped with a hammer, will resound with a bell-like tone, showing its high quality. This test is not nearly as convincing, however, as the acid test to which General Ceramics products may be submitted with complete confidence. They are not merely acid resistant but acid *proof* throughout. This, in use, means first, the elimination of product contamination; second, greater protection of plant personnel and property because

there can be *no* hazardous leaking; third, longer lasting stoneware equipment, for, once installed, General Ceramics Stoneware lasts indefinitely; and fourth, its hard glazed surface makes General Ceramics Stoneware easy to keep clean.

Included in General Ceramics Chemical Stoneware for industrial use are acid proof pipe, valves, fittings, kettles, jars, pots, pumps, exhausters, coolers, condensers, acid elevators, towers, filtering equipment and tourills.

*Other products include Steatite Insulators made by General Ceramics & Steatite Corp., Keasbey, N. J.*

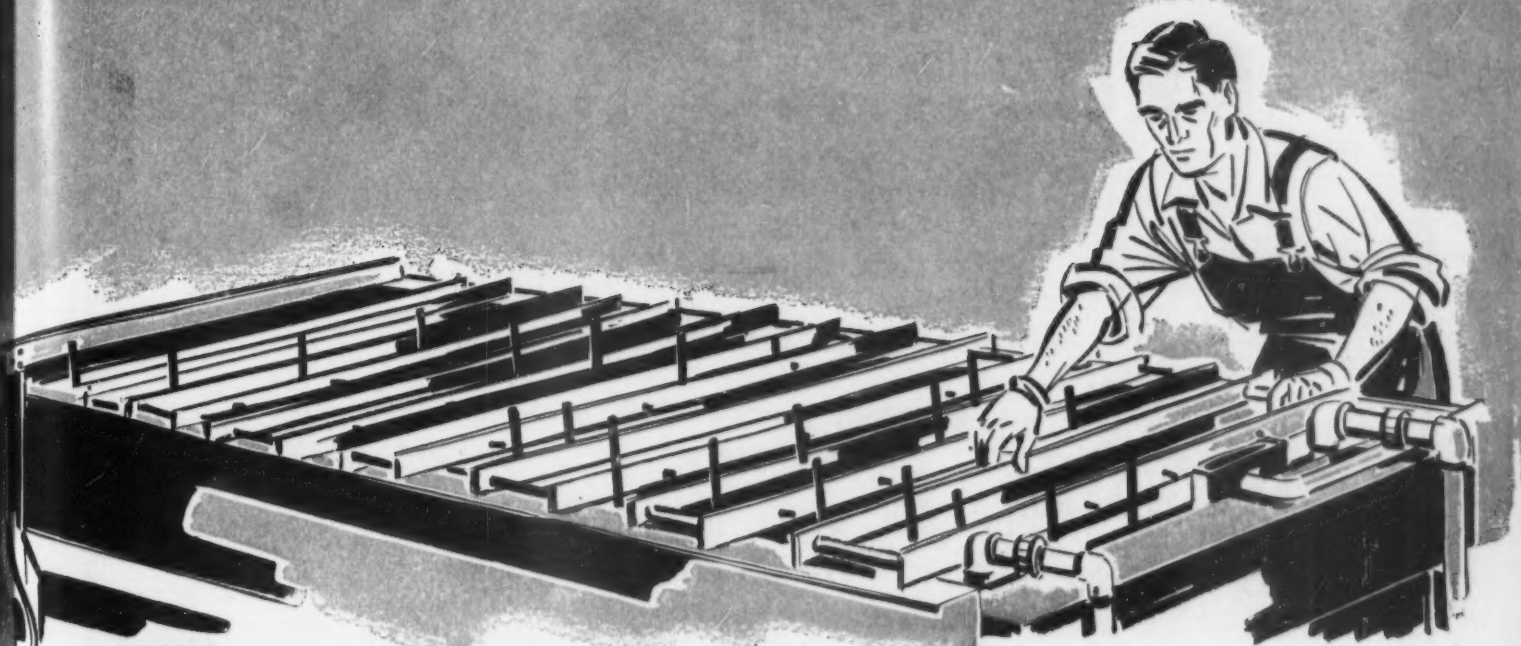
# General Ceramics Co.



**CHEMICAL STONEWARE DIV.**  
**KEASBEY • NEW JERSEY**

3811

# TO SAVE TIME, LABOR, METAL



## -7 ANSWERS to your insulation and protective problems

### ☆ UNICHROME "AIR DRY" RACK COATING

—a tough, easy-to-use rack insulation that saves frequent recoating—withstands hot alkaline cleaners, acid dips, hard chromium solutions and chromic or sulphuric anodizing baths.

### ☆ UNICHROME "QUICK DRY" STOP-OFF 322

—a fast-drying, resistant lacquer that speeds preparation and handling—specially compounded for cyanide copper, chromium and other plating work requiring an extremely adherent stop-off.

### ☆ UNICHROME "QUICK DRY" STOP-OFF 323

—a fast-drying, resistant lacquer that speeds preparation and handling—specially compounded for Parkerizing, chromium and other plating work requiring a stop-off that can be peeled off after use.

### ☆ UNICHROME RESIST SHEET AND ROD

—a solid insulating material that is readily fabricated and extremely resistant to all plating room chemicals—specially suitable for constructing composite plating racks, stop-off shields, insulating gaskets and lattices for preventing short circuits in anodizing tanks.

### ☆ UNICHROME STOP-OFF COMPOUND 311

—a solid, wax-like formulation that saves preparation time in stopping off complicated shapes—suitable for work requiring resistance to boiling hot cleaners, acid dips and high temperature plating solutions.

### ☆ UNICHROME RESIST LACQUER BG

—a heavy-bodied, resilient insulating lacquer that has excellent all-round chemical resistance—specially suitable for hard chromium and Parkerizing work requiring a stop-off that can be peeled off after use.

### ☆ UCILON

—an air-drying protective coating that is remarkably resistant to the action of both acids and alkalis, salts, cleaning compounds, oxidants and moisture—specially suitable for painting on ducts, equipment and other metal, wood, or concrete surfaces exposed to corrosion.

### FOR FURTHER DETAILS

or an initial order, write briefly stating your problem and the work for which the insulation is intended.

☆ Trade mark Reg. U.S. Pat. Off.

**UNITED  
CHROMIUM  
INCORPORATED**

51 East 42nd St, New York, N.Y.  
Waterbury, Conn. • Detroit, Mich.



# BRUSHING NUGLU

The liquid cold glue and abrasives mixed.

**ALWAYS READY TO USE.**

**PRODUCES ALL POLISHED FINISHES.**

Successfully used and adopted by over 80% of the aircraft engine manufacturers.

**APPLY A THIN COAT WHILE POLISHING AND KEEP ON POLISHING.**

**J. J. SIEFEN COMPANY**  
**DETROIT, MICH.**

**A PUMICE**  
**TO MEET EVERY NEED**



Not until Valencia — the standard of American Pumice — was discovered at Grants, New Mexico, was it thought that a domestic pumice could match the quality of imported Italian Pumice. This inexhaustible deposit at Grants is true pumice stone and not a volcanic ash. It is physically and chemically equal in every respect to the now unobtainable Italian Pumice. • The Valencia plant's output of grades for every need is rigidly under control for particle size, purity, weight and color.

Check this table comparing Valencia with the highest grade of imported Italian Pumice. See for yourself that Valencia is truly the standard of American Pumice.

	American Pulverized Per Cent	Italian Select Per Cent
Silica .....	72.90	73.24
Alumina .....	11.28	10.61
Iron Oxide .....	.86	1.57
Titanium Oxide .....	.06	.10
Calcium Oxide .....	.80	1.10
Magnesium Oxide .....	.36	.40
Soda .....	3.64	3.03
Potash .....	4.38	5.58
Sulphuric Anhydride .....	.03	.05
Loss on ignition .....	5.20	4.04

*Distributors of*  
**THE PUMICE CORPORATION**  
*of*  
**AMERICA**  
GRANTS NEW MEXICO

**WHITTAKER, CLARK & DANIELS, INC.**

260 WEST BROADWAY • NEW YORK CITY

Warehouses: Detroit, Michigan and South Kearny, N. J.

*D. Ornstein & Sons Inc.*  
Manufacturers of Watch Cases and Movements  
CABLE ADDRESS: DA-ORNS NEW YORK

**L.C. BALFOUR COMPANY**  
ATTLEBORO - - - MASSACHUSETTS

*The Parker Pen Company*  
JANESVILLE - WISCONSIN - U. S. A.

**J. D. Watch Case Company, Inc.**  
NEW YORK CITY  
121 VANICK STREET  
TELEPHONE WALKER 5-8933-A-5

**MARCEL BOUCHER ET C<sup>IE</sup>**  
DESIGNERS & MANUFACTURERS OF FASHION JEWELRY  
NEW YORK CITY  
SHOW ROOM  
383 FIFTH AVENUE  
TELEPHONE MUZZY 7-1100

*Armbrust Chain Co.*  
MANUFACTURERS OF MACHINE MADE CHAINS

*Excell* MANUFACTURING COMPANY  
45 RICHMOND STREET  
PROVIDENCE, R. I.

**KESTENDIAN BROS. MFG. CO.**  
MANUFACTURING JEWELERS  
WATCH-BRACELETS  
180 CHESTNUT STREET  
PROVIDENCE, R. I.

## Leaders in Industry use



### PALLADIUM PLATING SOLUTION

PALLITE has been tested and used successfully for more than 11 months by leading manufacturers in many important industries.

**PALLITE is quick**—flash about 5 seconds;

**PALLITE is stable**—as stable as any solution of this nature can be;

**PALLITE is easy to use**—no complicated Voltmeter and Ammeter readings are necessary.

Compare PALLITE with any other solution. Better still, don't take our word for it; let the successful results of firms in your industry prove this to you. That's a fair comparison.

For PROVEN results, insist on PALLITE.

## PRECIMET LABORATORIES

Division of GEORGE C. LAMBROS

Research & Development Engineers in Precious Metals

64 Fulton Street

New York

# **ENGINEERING AUTHORITIES SPECIFY DU-LITE for Engines**

## **DU-LITE**

will produce a highly satisfactory finish on most steels—soft, low carbon steel, or heat-treated parts of alloy steels.

## **DU-LITE**

not only provides a durable, tough finish which is a protection against rust, but also colors the steel an attractive black.

## **DU-LITE**

is an aid to lubrication. Processing smooths microscopic roughness and produces an oil absorbing — oil holding oxide surface. This combination definitely aids lubrication in closely fitted bearings. Extremely close tolerances are maintained for there are no dimensional changes by the use of Du-Lite.

## **DU-LITE**

representatives cover the industrial sections of the United States and are available for consultation on your specific problems. Write today.

**DU-LITE CHEMICAL CORP.  
MIDDLETOWN, CONNECTICUT**



# THE UDYLLITE MULTI-PURPOSE BARREL

FOR CLEANING,  
DRYING, PLATING,  
RINSING OR PICK-  
LING OF SMALL  
PARTS:

Here is a barrel that is really "Jack of all work"—It will do practically anything required in the finishing of small parts and at a saving in time and money. Used as a plating barrel, it really turns out the work—fast!

The Multi-Purpose Barrel is sturdily built for long, trouble free service. Efficiently designed and constructed in the typical Udyllite manner. Bearings are located well above solution level and cathode contacts may be quickly and easily removed for cleaning.

The cylinder is unusually large, capable of handling a big load of smaller parts. Unloading is quickly accomplished by pulling the dump lever at the side.

The Multi-Purpose Barrel is available in several combinations to meet your requirements—① For Cyanide Plating or Electro Cleaning—② For Acid Plating—③ For Tumble Cleaning—④ For Pickling—⑤ For Dyeing—⑥ For Rinsing—Each equipped for its specific use.



## • SPECIFICATIONS •

TANK—32 x 36 x 30, 125 gallon capacity. Cylinder 23 x 23 with 16 inch opening; capacity one peck or 50-70 pounds. Built-in loading chute. Perforation  $\frac{3}{16}$ "—larger if desired. Motor  $\frac{1}{2}$  H. P. 110 Volts, 60 cycle, single phase, AC, with cord and plug.

## THE UDYLLITE CORPORATION

1651 E. Grand Blvd., Detroit, Mich.

Chicago  
1943 Walnut Street

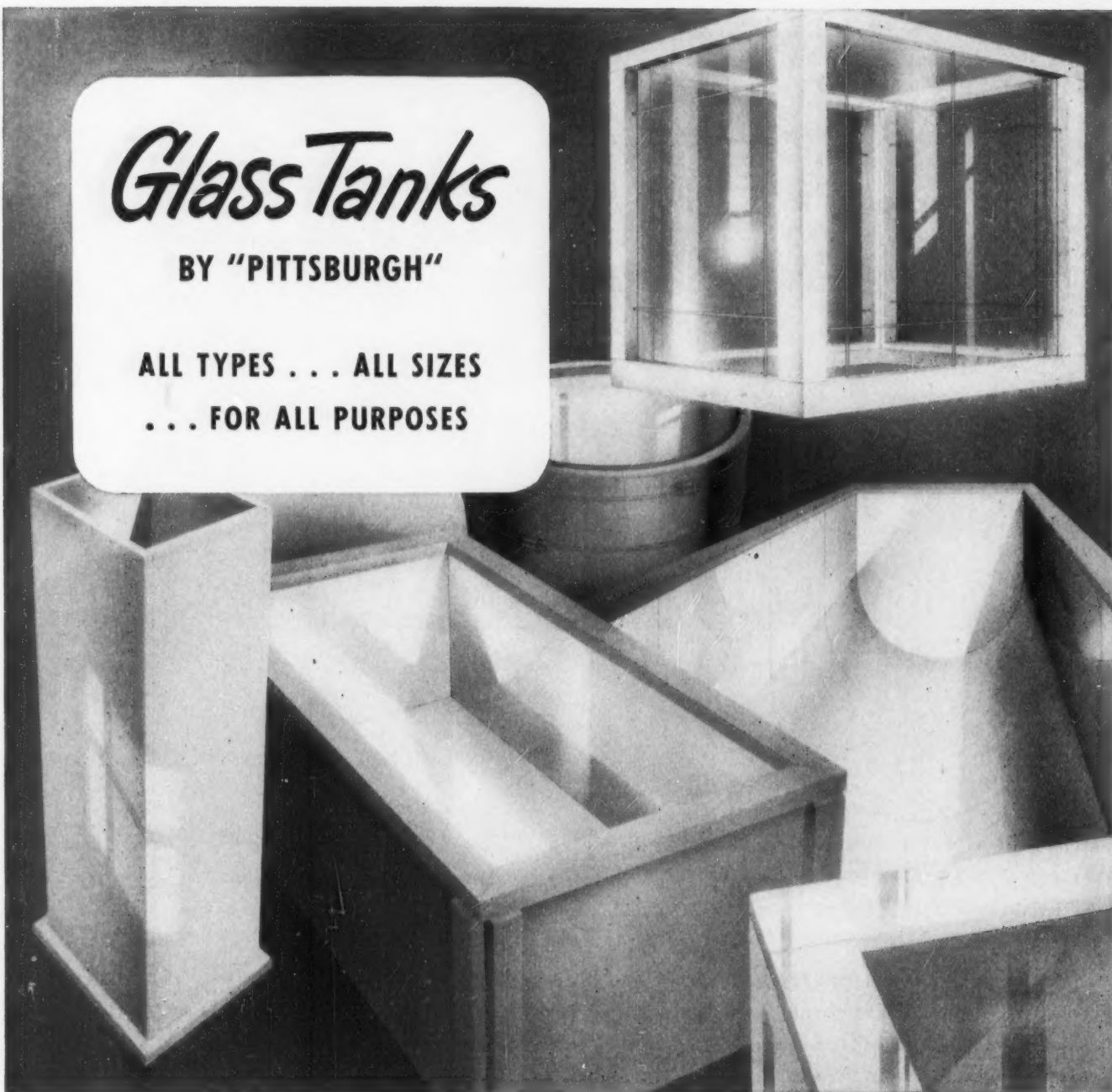
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. . . FOR ALL PURPOSES



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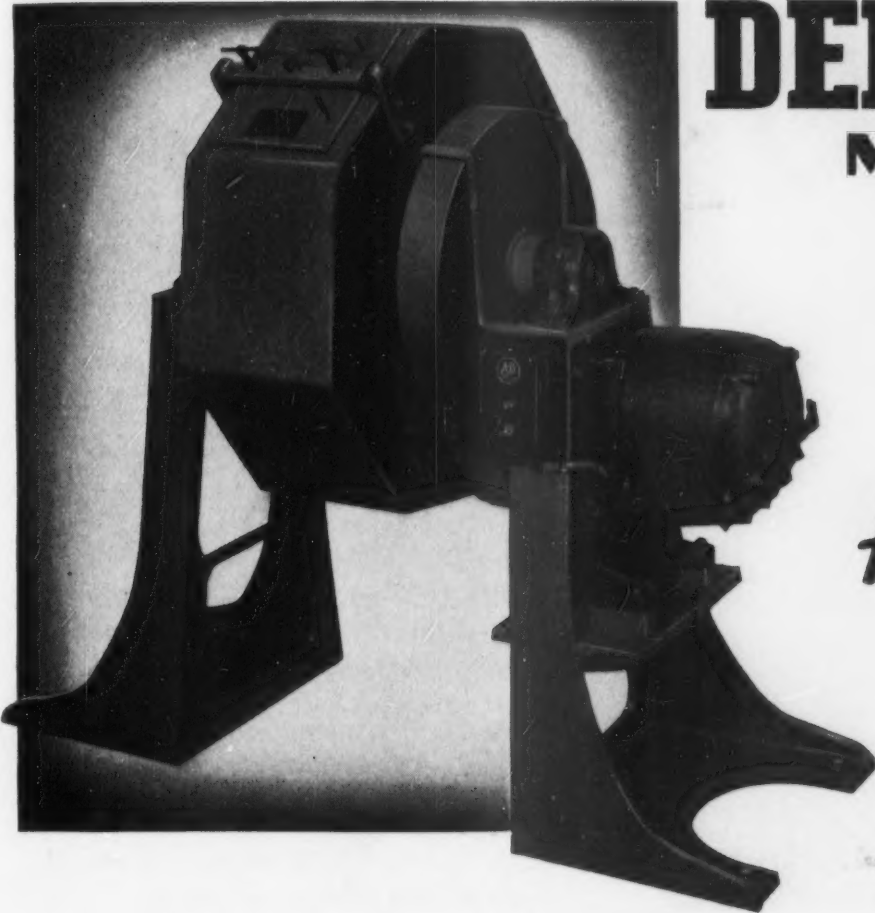
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*"PITTSBURGH" stands for Quality Glass and Paint*

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# Scientific

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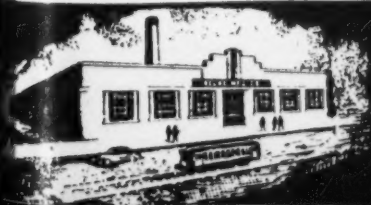
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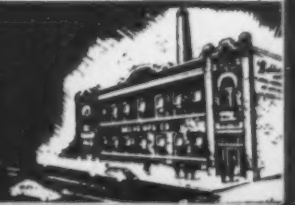
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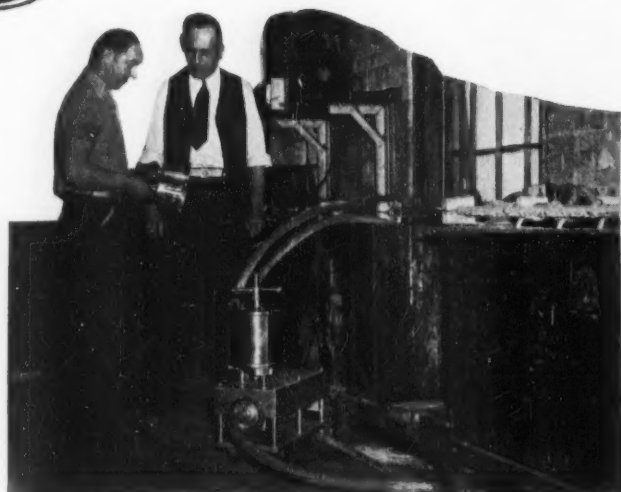




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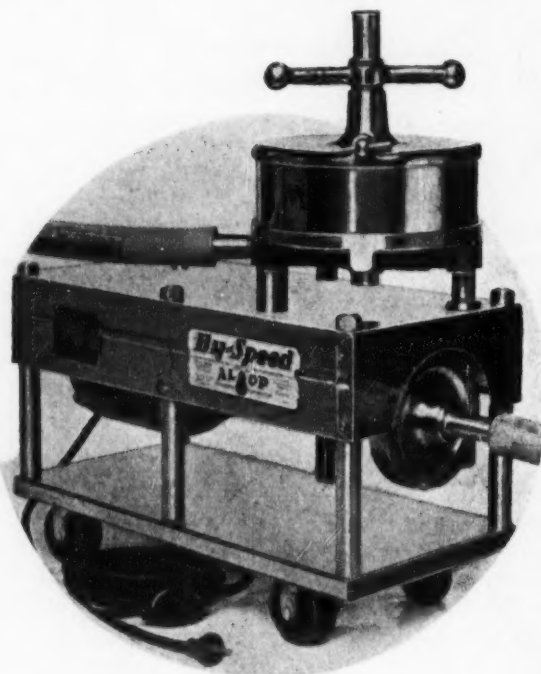


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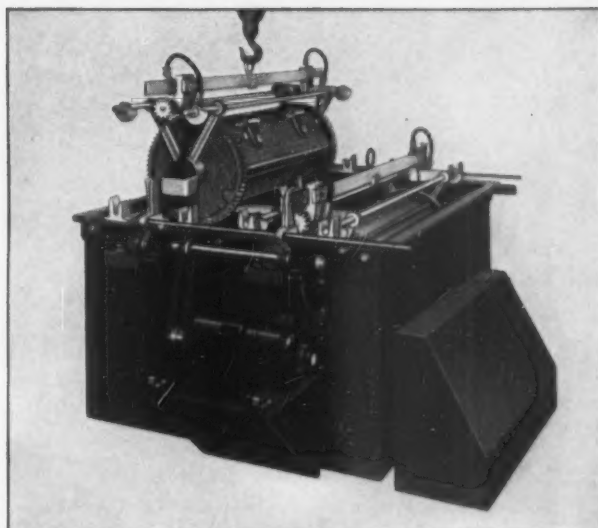
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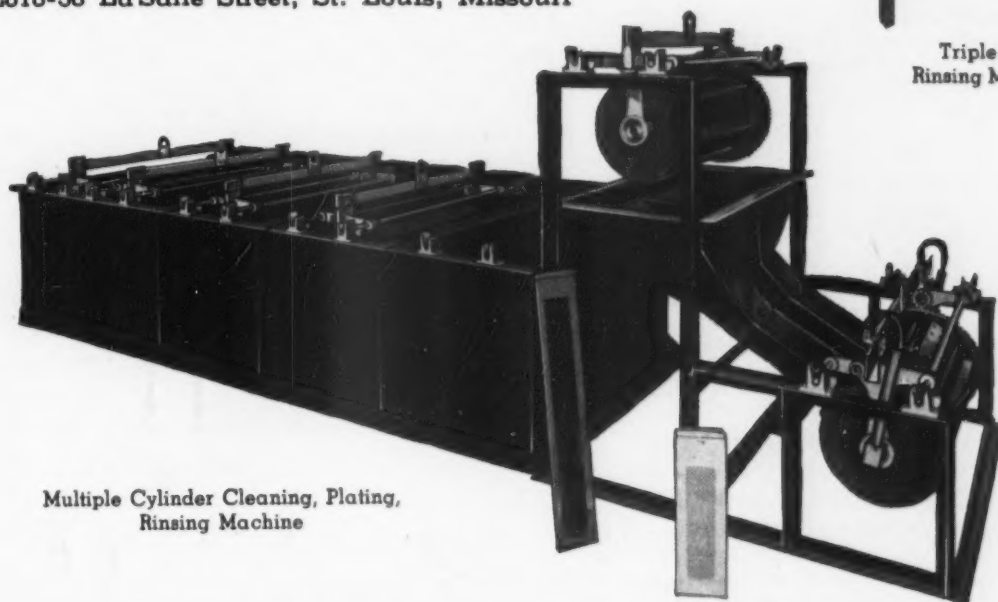
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Twin Unit Barrel Plater



Triple Unit  
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Multiple Cylinder Cleaning, Plating,  
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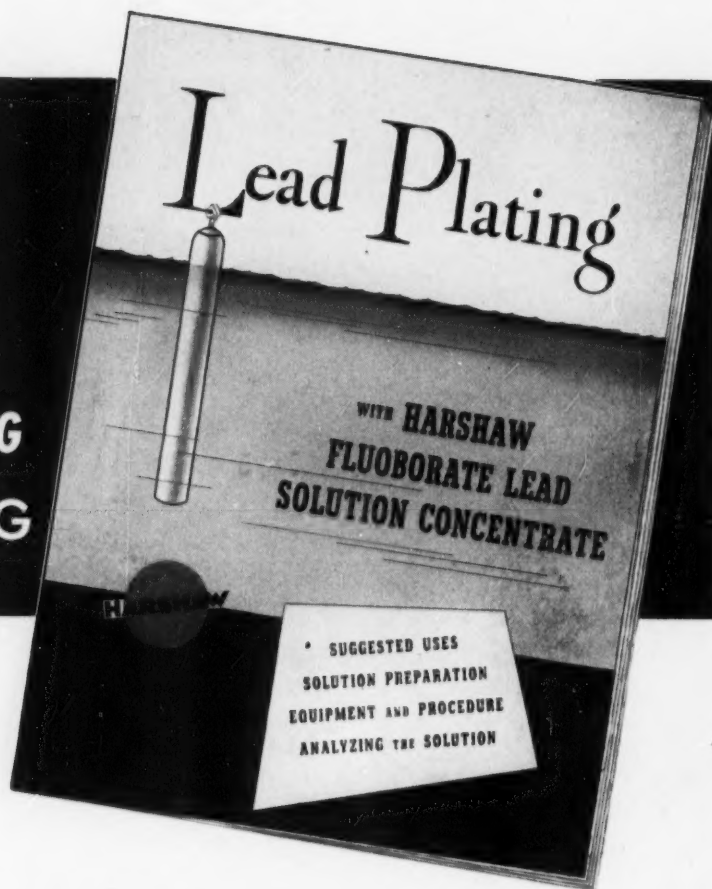
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IF YOU ARE NOW  
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OR  
IF YOU ARE PLANNING  
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*Free*  
**8-PAGE BOOKLET**



**SOME OF THE SUBJECTS  
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- Applications for lead plating
- Preparation of the solution
- Bath concentrations and rate of deposition
- Thickness of deposits
- Tanks
- Current densities and voltages
- Temperature
- Determining pH
- Anodes
- Agitation
- Operating notes
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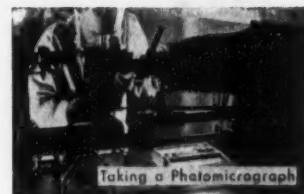
If you want to be sure of uniformly excellent silver plating results and uninterrupted plating production, specify 999 "Plus" Fine next time you order Anodes.

NOTE: In addition to their many uses by the Arts and for plating airplane bearings, Handy & Harman 999 "Plus" Fine Silver Anodes are also used in making reflectors and other war products needing the advantages of a silver coating. Also, by doing plating formerly done with copper, nickel, chromium and cadmium, they are releasing large quantities of these strategic metals for other work.

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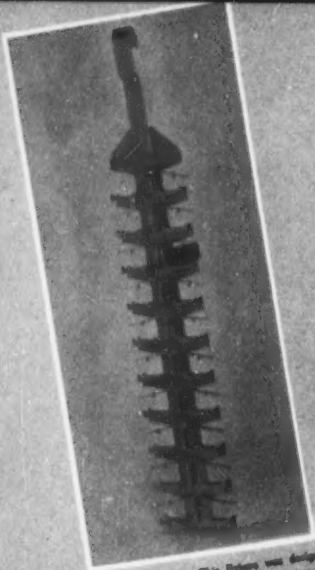


Figure No. GLN-11 B (S or L)—This fixture was designed primarily for anodizing long thin sheets and the like, two fixtures being used, one with a long hook and the other with a short hook (S or L). This gives the parts needed a slope for drainage and to avoid gas pockets.

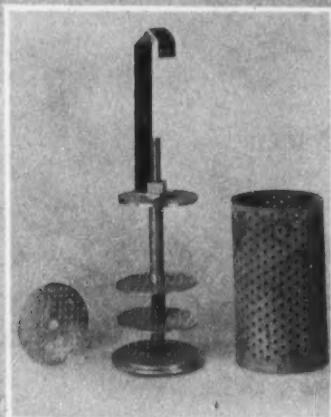


Figure No. GLN-8-43-7 (1/4" or 1/2")—This fixture is designed for small parts that are suitable for both anodizing. The cylinder is of "micarta" and is 12" long and 6" in inside diameter. The balance of the fixture is of 34 ST Aluminum. The cylinder will be drilled to the customer's specifications. Standard diameter holes are 1/4" or 1/2". Aluminum sleeves are furnished with each fixture. This is to be used when a partly filled basket of parts is being run. The two spacers shown in the photograph below the intermediate plates are for photographic purposes only to show the fixture more advantageously.

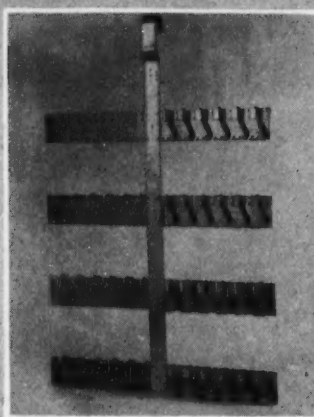


Figure GLN No. 9-D-4—This fixture is 5' 0" in overall length and 3' 0" in overall width; has 48 openings and may be used for metal stampings and similar parts. For long narrow slabs two (2) fixtures are used together. Fixtures of this type may be obtained with two (2) or more arms, depending on the width of parts to be racks. On the four (4) arm fixture shown, the distance between the arms is 8 1/2" and the top arm is 14" below the top of the rack. The slots are 1/4" wide and 3 1/4" deep.



Figure GLN No. 827—This rack is 5' 0" in overall length and designed for anodizing castings. Fixtures of this type will be designed to suit the part to be anodized and a small number should be submitted to facilitate the design and manufacture. Parts are racked on either side of the spine and the capacity of the rack depends on the size and shape of the parts to be racked. The one shown has a capacity of four.

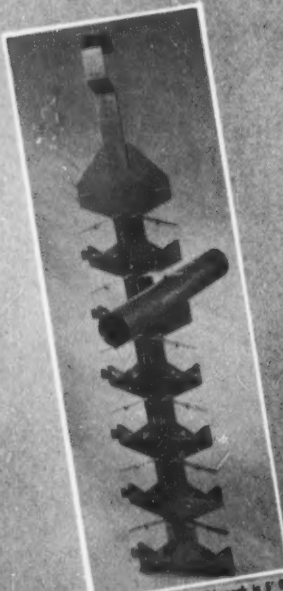


Figure No. GLN-19 B (S or L)—This rack is 5' 0" in overall length and designed primarily to anodize tubing. Two fixtures being used together, one with a short handle (S) and one with a longer handle (L). The size of the secondary diameter of the tubing of the parts to be racked which also determines the capacity. One rack may be used alone to anodize plates and two 2' 0" long.

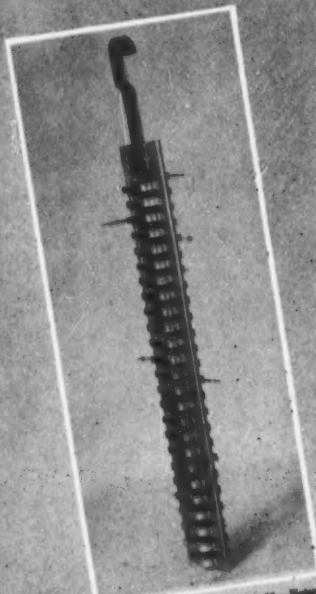


Figure No. GLN-17—Overall length 5' 0". Fixture shown has 20 openings (10 on each side of spine) suitable for a large range of small parts. Width of spine is 4". Contacts are spaced to suit the customer's requirements. Contacts are spaced 1/4" and 1/2" between slabs; one side to show necessary hold cylindrical parts of small diameter.

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Photographs show a few styles of racks, especially adapted for anodizing tubing, castings, stampings, large sheets and a variety of small parts. The overall length of the fixtures are made to suit the depth of the tank, a 5' 0" length being standard for a tank 5' 0" deep.

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To facilitate the design and manufacture of proper fixtures, samples or blueprints should be submitted.

Patents applied for.

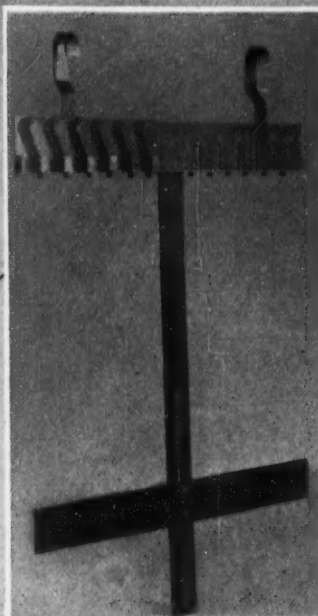


Figure No. GLN-277—This fixture is 4' 3" in overall length and 3' 0" in overall width. The upper part of the fixture is of 34 ST Aluminum and the spine and bottom cross piece are of "micarta". This fixture is used to anodize thin or sheet aluminum parts; two fixtures being used together, one at one end of the sheet and the other fixture at the other end of the sheet. The slots are 1/4" wide and 3" deep. This fixture has a capacity of 12 sheets and can be made to take any width sheet that the customer may have to anodize. Gates long sheets of light gauge may require a third fixture for support at the center.

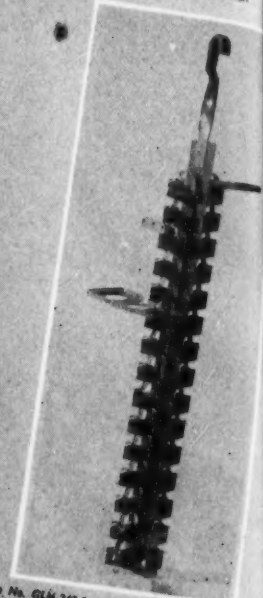


Figure No. GLN-245-1—Overall length 5' 0" distance from spine to outside of contact is 3". Suitable for a large variety of small parts. Two fixtures may be used together to anodize parts of small diameter or extrusions or the like. The fixture shown has 20 contacts (10 on either side of the spine). Handles have 90° twist so that long pieces are held lengthwise in the racks.

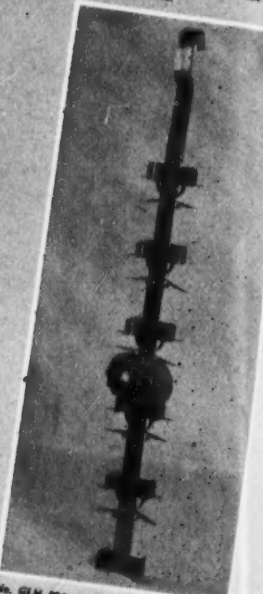


Figure No. GLN 804—This type of fixture is designed primarily for castings such as the one shown or of similar shape. The overall length of this particular fixture is 5' 0". For a sample of the place to be racked, in order to facilitate its design and manufacture.

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# METAL FINISHING

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MAY, 1943

NUMBER 5

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## CONTENTS

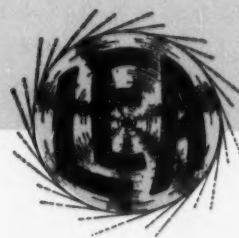
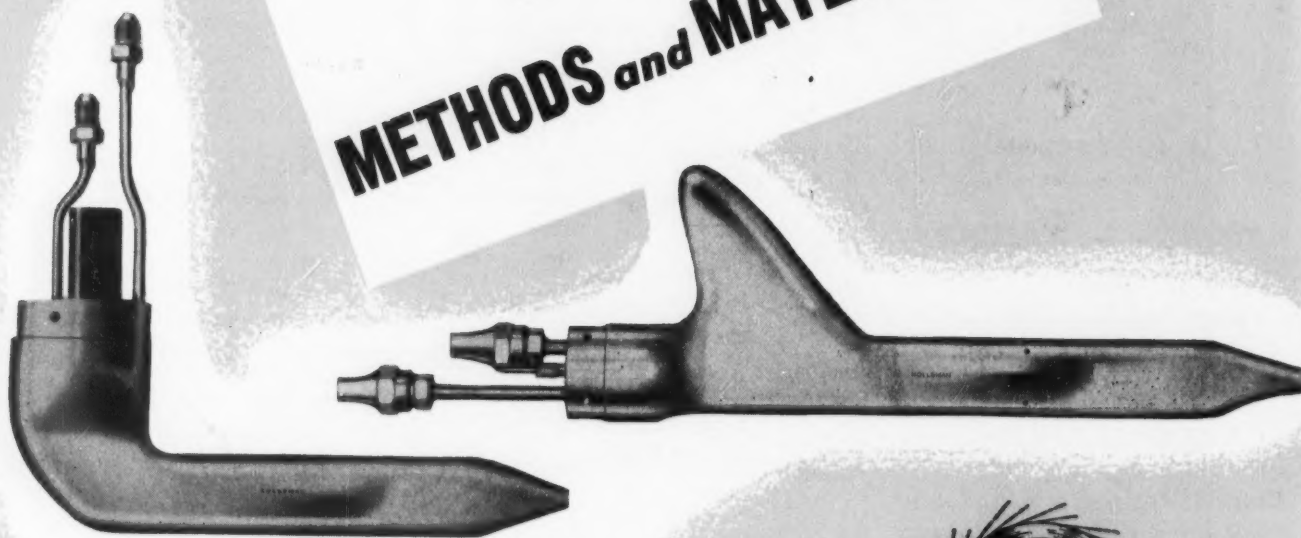
Editorial .....	265
Stainless Steel and the Metal Finishing Foreman—By Stephen J. Olphie .....	266
Stretching Rubber Supplies .....	268
The Electrodeposition of Silver on Magnesium—By Francis J. Bowen and L. I. Gilbertson .....	271
Glycerine Usage in Metal Treatment—By Georgia Leffingwell and Milton A. Lesser .....	272
Recent Developments in Zinc Plating—By Myron B. Diggin .....	277
Blushing of Lacquers—By Peter B. Torrance .....	314
The Care and Conservation of Brushes .....	318
Agitation of Finishing Materials—By John E. Hyler .....	323
New Mill Treated Rust Resistant Sheets and Strip .....	327

## DEPARTMENTS

Dictionary of Metal Finishing Chemicals .....	275
This Is Washington .....	282
Shop Problems .....	286
Patents .....	287
New Equipment and Supplies .....	288
Manufacturers' Literature .....	296
New Books .....	299
Obituary .....	300
Associations and Societies .....	301
News from California .....	304
Business Items .....	306
Supply Prices .....	308
Odds and Ends .....	38

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Your product may be similar to a Kollsman Tube or it may be as unlike it as a tank is to a machine gun. Yet, if you carry out a burring, polishing or buffing operation, you might also profit by adopting LEA Methods and Materials. We'll be glad to discuss your problem with you.

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S-L.M.-3

## WATER PURIFICATION

The contamination of plating solutions and the staining of finished surfaces due to the use of hard or impure water are not new phenomena to metal finishers. The effects of various salts which may be present in raw water supplies have been pointed out by finishing authorities in a number of articles written during the last few years.

Removal of calcium and magnesium hardness from raw water by additions of water softening chemicals in the barrel prior to the addition of soap has been standard ball burnishing practice for decades and the results have been generally satisfactory. The plater is not so fortunate, however, since his troubles are caused not only by calcium, magnesium and other metals but by the associated anions such as chlorides, sulfates, bicarbonates and carbonates. The operation of plating solutions, especially at elevated temperatures, requires periodic replacement of the evaporation losses with resultant accumulation of these salts when raw water is used for the purpose.

There have been cases, for example, where, due to high chloride concentration in the water supply, deposits from an acid copper bath became so nodular that it was necessary to treat the solution with silver sulfate from time to time to precipitate the chlorides. In other instances, sulfates have resulted in precipitation of lead sulfate during the operation of lead fluoroborate plating baths, causing rough deposits.

To avoid such contamination, it is common practice in the case of small installations to use distilled water, especially for precious metal baths such as gold and rhodium. This is not entirely satisfactory because of the drag-in of salts from the rinses preceding the plating bath, and in large tanks the expense involved makes the procedure impracticable. The cost of distilling water on the premises in the

quantities required for running water rinses and bath replenishment is usually prohibitive even where sufficient steam is available at low cost. The answer to the problem lies in water demineralizing.

*Cation exchangers*, such as the zeolites, are familiar to most technical men, and have been in use for many years for removing calcium and magnesium in hard water by replacing them with sodium ions, the zeolites being regenerated with common salt solution. A later development was the so-called hydrogen zeolite which replaced these metals with hydrogen ion instead of sodium, leaving only the corresponding acids in solution. Since about 1937 *anion exchangers*, in which the anions are replaced by hydroxyl ion, have been developed to a high state of efficiency. It is now possible to pass water through a two-step demineralizer, replacing the cations with hydrogen ion in the first step and the anions with hydroxyl ion in the second step, the two combining to form water. The result is an effluent which approaches distilled water in quality, and at almost negligible cost.

The exchangers are regenerated with sulfuric acid and soda ash. The cost of chemicals for regeneration of an exchanger treating raw water containing, for example, 20 grains of methyl orange alkalinity and 15 grains of chloride and sulfate per gallon, may be as low as 27 cents for each 1,000 gallons of raw water treated. Units are available with capacities of as little as one gallon per minute and are designed to fill almost any requirement.

We believe that this process will become increasingly popular in the metal finishing industry as the advantages of purified water begin to impress themselves on plant operators, especially for high speed plating and in hard water areas. There will come a time when a water purifier will be as necessary a piece of equipment in a modern plating room as a filter.



# Stainless Steel and the Metal Finishing Foreman

By STEPHEN J. OLPHIE

*Metal Finishing Foreman, J. Sklar Mfg. Co.,  
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A FEW years ago stainless steel was introduced to the metal finishing world. Because of the scarcity of information concerning this alloy at the time, stainless steel acquired the reputation of a "miracle metal". Many felt that it would eventually replace all types of metal finishes. It was rumored that the electroplating industry, especially, would be affected by the remarkable "non-corrosive" characteristics of this solid solution of chromium, nickel and iron.

Today, admittedly, the electroplating industry has been affected by the war effort. Due to critical shortages of materials and labor, the plating foreman has had to make adjustments and changes in his own field—electroplating—and acquire additional practical and technical knowledge in other methods of metal finishing. Listed among the present duties of any metal finishing foreman are the dipping, pickling, polishing, buffing, oxidizing, anodizing, plating and painting of metals. One of these metals, surprisingly enough, is stainless steel. The metal finishing foreman must understand this alloy thoroughly if he means to process and develop it. Develop it he must, for the most important fundamental he learns is: the very life of this so-called "miracle metal" depends upon how well he handles its finishing.

The first step in understanding the finishing of stainless steel is the learning of its formula and manufacturing methods. Stainless steels are divided into general classifications:



Stephen J. Olphie

## Group I—Austenitic

Typical of this group is the commonly termed "18-8" Stainless.

*Composition—*  
Chromium—18%  
Nickel—8%  
Others—2%  
Iron—Balance

*Scaling temp.—1650° F.*

*Forging temp.—2200° F.*

*Annealing temp.—1900° F.*

*Type of scale—*Combinations of iron, nickel and chromium oxides.

*Characteristics —* Non-hardenable by heat treatment—hardenable by cold working. Non-magnetic.

## Group II—Ferritic

Typical of this group is the commonly termed "17 Chrome" Steel.

## Composition—

Chromium—17%

Others—2%

Iron—Balance

*Scaling temp.—1550° F.*

*Forging temp.—2000° F.*

*Annealing temp.—1350° F.*

*Type of scale—*Combinations of chromium and iron oxides.

*Characteristics —* Non-hardenable by any treatment. Magnetic.

## Group III—Martensitic

Typical of this group is the commonly termed "12 Chrome" Steel.

*Composition—*  
Chromium—12%  
Others—2%  
Iron—Balance

*Scaling temp.—1300° F.*

*Forging temp.—2100° F.*

*Annealing temp.—1550° F.*

*Hardening temp.—1750° F.*

*Type of scale—*Combinations of chromium and iron oxides.

*Characteristics—*Hardenable by heat treatment. Magnetic.

Information concerning temperatures and oxides formed in processing stainless steel is invaluable to the finishing foreman, for he is responsible for the complete removal of all foreign surface impurities. The most important impurity present on the surface of stainless steel after heat treatment is iron oxide. As long as any iron remains present on the surface of this alloy, corrosion resistance of stainless steel will be no better than

that of ordinary steel. Hence, the first step confronting the finishing foreman is descaling.

### Removal of Scale

Descaling of different types of stainless metals can be carried on most suitably by simply following the directions for pickling as recommended by the *Plating & Finishing Guidebook*:

Prior to pickling, remove all oil and grease by any suitable degreasing method.

For loosening of any heavy scale which forms on the surface of 18-8 stainless, the following solution is satisfactory:

Sulfuric acid . . . 10 parts by volume  
Hydrochloric acid 5 " " "  
Water . . . . . 85 " " "  
Temperature—150° F.

Time of immersion—10-15 minutes.

For loosening of the heavy oxide which forms on the surface of the 17 and 12 chrome steels, the following solution is good:

Sulfuric acid . . . 10 parts by volume  
Water . . . . . 90 " " "  
Salt . . . . . ¼ lb./gal.  
Temperature—160° F.

Time of immersion—10-15 minutes.

The loosened scale, and all light oxides, (such as the ones resulting from hardening in a controlled atmosphere, which prevent oxidation upon exposure to air) may be removed by immersion in the following solution:

Hydrochloric acid . 25% by volume  
Water . . . . . 75% " "  
Nitric acid . . . . ¼ lb./gal.  
Temperature—150° F.

Time of immersion—3-5 minutes.

Semi-lustrous finish produced.

All three of these solutions will eventually attack stainless steel, and they should include a daily addition of a good commercial inhibitor. As the solutions are very corrosive, tank construction is very important. Probably stoneware containers are more practical than any metal tanks, and serve to better advantage over a given period. Adequate ventilation is very important and should be provided over every solution.

### Polishing and Buffing

After descaling, the next operation concerning the foreman of the metal finishing department is abrasive polishing and buffing. In polishing,

he will soon discover that the usual abrasive employed — emery — will prove detrimental to stainless metals. Emery contains from 15-30% iron oxide. If iron oxide becomes embedded in the pores of chrome steels, it may cause rusting or discoloration or both. Another abrasive available for polishing is aluminum oxide. The chemical characteristics of  $Al_2O_3$  make it ideal for polishing stainless steel. It does not contain iron oxide. However, it is much harder and sharper than emery, and these factors must be watched closely in preparing a cycle of polishing operations.

Another important point in any polishing is proper setting up of wheels. If glue is the binding medium employed, it should be maintained at a temperature of 140-160° F. It should never be heated above 160° F. as overheating results in almost 50% loss of binding power. Wheels and abrasives should be pre-heated to prevent rapid cooling of glue. Abrasives should be kept separate to insure against mixing of fine grain sizes with rough grains. Proper wheel speed is important, and stainless steel may be polished at a speed of 7,000-9,000 surface feet per minute.

After polishing, passivation or immunization should be applied. This treatment in a 20% by volume nitric acid solution at a temperature of 140° F. will tend to dissolve all foreign surface impurities and aid in the formation of a film of chromic oxide.

After passivation, the stainless steel is ready for buffing. Here, two operations are generally required. The first, called "cutting down", involves the use of a compound containing finely divided aluminum oxide. This is followed by a "coloring" operation, with the aid of a compound containing chromic oxide. Buffing wheel speed used is in the vicinity of 10,000-11,000 surface feet per minute.

### Cleaning and Testing Passivity

Following buffing, the foreman finisher must supervise proper cleaning of compounds which may pack tightly into crevices. The best method of degreasing is probably a cycle of alkaline cleaners. A 15-30 minute soak in a good commercial cleaner, followed by an electrolytic treatment with direct and reverse current in a caustic solution should prove capable of removing any grease or insoluble mat-

ter. Cleaning may be accomplished with a 6-8 volt line at a current density of up to 200 amperes per square foot. A few short shots of direct current will tend to loosen particles of dirt. A few short shots of reverse current will tend to remove the loosened particles. The short shots of current should be of 2-3 seconds duration. The shortened time helps minimize discoloration and oxidation of the steel. Alkali carry-over must be neutralized, preferably in a weak solution of nitric acid. Good rinsing is the keynote in all handling of stainless steels in solutions.

The next step of importance to the metal finishing foreman is testing the stainless steel he has supervised in processing. Testing will reveal how well he has done his job. A one minute immersion in a solution containing 10 grams of the sulfuric acid, 4 grams of copper sulfate, and 99 cc. of water, will provide a suitable test of his work. If the metal picks up an immersion copper plate, it means iron oxide is still present on the surface and must be removed.

### Plating on Stainless Steel

In these times when stainless steel has become scarce, the metal finisher is sometimes faced with a combination of brass and stainless steel shaped into one item. Naturally, the brass, which is subject to corrosion, must be protected. This may involve plating. Plating can be carried out as follows:

Clean the combination in the usual manner as for all plating, followed by a 2-minute treatment as cathode in a 25% hydrochloric acid solution, using carbon anodes. This treatment breaks down the passive film of chromic oxide and leaves the surface in an active state, ready to receive and adhere to a subsequent plate.

A better method is one suggested by Donald Wood:

*Solution formula:—*

Nickel chloride . . . . . 32 oz./gal.  
Hydrochloric acid . . . 16 " "  
Nickel anodes. Room temperature.

This solution activates the stainless surface and immediately deposits nickel upon it.

A field of importance for future reference is electropolishing. This comparatively new process has tremendous possibilities and research may some day lead to complete finishing of stainless steel by electrochemical methods.

# S-T-R-E-T-C-H-I-N-G RUBBER SUPPLIES

## The Care and Treatment of Rubber Gloves for Longer Life

**R**UBBER was placed high on the critical materials list in America with the capture of 90 per cent of the world's rubber supply by the Japanese in the first three months of the war. Moreover, concurrently, our peacetime consumption of about 600,000 tons annually jumped several hundred thousand tons to meet the demands of war, and the stockpile totaled only one year's supply.

The Baruch Committee, after studying the situation, reported last September that the rubber shortage was dangerous and laid down a comprehensive plan to meet this threat, including a synthetic rubber program designed to produce 1,037,000 tons annually.



Fig. 1. Wear proper gloves for each job. Use light-weight gloves for handling small objects.

Unfortunately, the equipment required for the production of synthetic rubber could be allocated only at the expense of the high octane aviation gas and the convoy escort ship programs and the battle which ensued in Washington between the agencies involved was not settled until January 30th of this year. On this date a directive from the chairman of the War Production Board gave top preference to 43.6 per cent of the rubber program, assuring annual production of only 452,000 tons as against the 1,037,000 tons recommended by the Baruch Committee. This cut necessitates strict conservation measures on the part of all users of rubber.

A recent government order has prohibited the use of rubber for plating equipment. Platers still have the use of rubber hose, aprons and gloves, however, and it is up to them to get the last bit of wear out of these articles after which they should not be thrown away but deposited in the scrap pile for reclamation.



Fig. 2. Don't hang up dirty gloves.

*(The photographs and directions on this and the following pages, furnished by The B. F. Goodrich Company, Akron, O., explain the proper treatment for rubber gloves in order to obtain maximum service life from them.)*



Fig. 3. Wash gloves with soap and warm water after use.



**WEAR THE PROPER GLOVES FOR EACH JOB.** Be sure to wear the *right kind* of gloves. Acid gloves should be heavy gauge to prevent any danger of torn rubber or

### DON'T DO THIS . . .

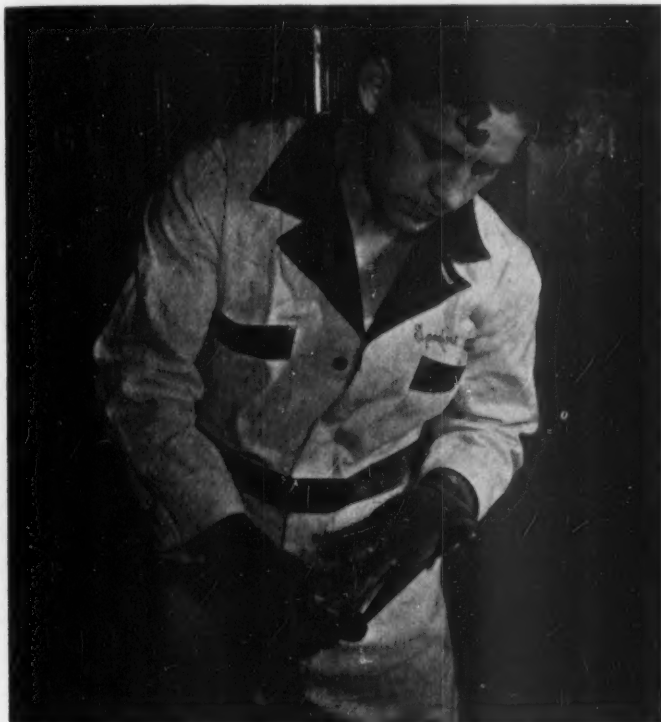


Fig. 4. Don't pull rubber gloves off this way.

the slightest penetration of acid. High voltage line-men and industrial workers who have heavy, rough work should guard their hands by wearing gloves made of thick, strong rubber. Wear light-weight gloves where there is less danger of tearing, snagging, heavy wear and where full "finger-tip feel" is desired for the handling of small objects. (Fig. 1). Gloves with a 9-inch gauntlet (18 in.-overall glove length) are recommended for working with acids and other active agents requiring full protection of the wrist and forearm.

If the glove *fits the job*, you'll get longer service, more protection and you'll be assured of greater working efficiency. It should be understood, too, that rubber gloves are not necessarily practical for *all* types of work. When handling exceptionally "hot" or sharp jobs, gloves made of materials other than rubber are recommended. Gloves for use in the presence of great heat or flame, for example, should be fireproof.

**WEAR PROPER SIZE GLOVES.** Mis-fit gloves are another cause of the high mortality rate in rubber gloves. Gloves that are *too large* will catch on sharp, jagged objects or in moving machinery. Gloves that are *too small* will tear easily or be punctured by finger nails while being put on or taken off. Rubber under tension will rip much more easily if pierced by a sharp object than it will when in normal shape. Tight gloves will also cause finger-tip tension and hand fatigue. *When gloves of improper size are worn on a job, efficiency is impaired.*

**KEEP GLOVES AWAY FROM SOLVENTS.** Industrial glove service may be reduced to but a few hours if care is not taken to keep them away from, and their surface clean of oils, greases, solvents and other natural enemies of rubber. These agents in contact with rubber will cause it to swell out of shape, become tacky and soft and lose all its capacity to stretch and return to normal shape.

**CLEAN GLOVES THOROUGHLY AFTER USE.** Don't hang up dirty gloves. (Fig. 2). The accumulation of material on them is likely to attack the rubber, cutting short its life. This is certain if the gloves have been used around grease, oils or solvents. To make sure that no harmful materials remain on glove surfaces, wash each one thoroughly before storage. It is recommended that lukewarm water and good grade soap be used. (Fig. 3.) Be sure to rinse off all soap after cleaning because some soaps have a high oil content which will harm the rubber. Rinse in cool or cold water. Then hang them up carefully to dry. Gloves in a hanging position will dry quickly and well both inside and out. Store in a cool place away from direct sunlight. Do not attempt to dry gloves hurriedly on a hot surface as this causes premature aging and quick deterioration.

**PEEL GLOVES OFF THE HAND.** Light-weight rubber gloves should not be pulled off by finger tips like leather or cloth gloves (Fig. 4) because by exerting pressure on the fingers, the glove is put under strain and may tear. Simply take hold of cuff and *peel off, inside out*. (Fig. 5.) Rubber gloves create a suction effect when finger tips are pulled and many snap off at finger ends.

### DO THIS INSTEAD . . .



Fig. 5. Rubber gloves should be peeled off the hand—like this.



Fig. 6. Dust gloves with talcum after using. This prevents tackiness on inside due to perspiration.

**USE TALCUM TO PREVENT TACKINESS.** Dust inside of gloves well with talcum each time they are removed. (Fig. 6.) Hand perspiration clings to gloves and will tend to make inside walls tacky if moisture is not dried promptly. Talc will also make the surface smooth so that hands will slip in easily. Be sure hands are dry since rubber gloves are extremely hard to put on if hands are moist or damp.



Fig. 7. Rotate gloves in use. A 24-hour rest period between wearings will increase their life.

**ROTATE GLOVES IN USE.** Keep two pairs of rubber gloves available for use and wear each pair every other day. One pair worn continuously day after day will wear out much more quickly than if given a 24-hour rest period between wearings (Fig. 7).

**PATCHING GLOVE TEARS OR SNAGS.** It is recommended that each user investigate the practicability of patching the gloves he uses when tears or snags develop. It is not considered safe to patch fingers or palms of electricians' or acid workers' gloves—the hazard is too great. However, in many cases and for many types of industrial work, patching is practical and provides many extra months of glove service. The use of patched gloves is shown in Figure 8.



Fig. 8. Patched gloves shown in use. For many types of work such gloves will provide extra months of service.

**RUBBER SALVAGE BOX.** Install a salvage box where worn-out rubber gloves and other rubber articles may be discarded. This will insure their being saved and returned to a rubber goods manufacturer for reclamation and prevent a careless clean-up man from burning or destroying them.



Fig. 9. Don't throw worn-out gloves away. The rubber can be reclaimed by a rubber goods manufacturer.

# THE ELECTRODEPOSITION OF SILVER ON MAGNESIUM

By Francis J. Bowen<sup>1</sup> and L. I. Gilbertson<sup>2</sup>

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2. Assistant Professor, Department of Chemistry and Chemical Engineering, The State College of Washington.

## Abstract

SILVER can be plated on magnesium, after cathodic cleaning and anodic treatment of the surface, in a boric acid-cyanide electrolyte. The thin film of electrodeposited silver is adherent. Although this silver film is porous the decorative value of the plate is high. The problem of plating magnesium with a nobler metal is largely one of a preplating treatment.

## Introduction

The electrodeposition of the nobler metals on active metals such as aluminum and magnesium from aqueous electrolytes presents a number of difficulties. A cleaned magnesium surface reacts very readily with water, displacing hydrogen. Silver is displaced by magnesium from neutral and acid solutions. These considerations impose certain restrictions upon the electrodeposition of silver upon magnesium in that an alkaline plating bath must be used. However, with a plating bath of a pH above 10.6, a film of magnesium hydroxide forms on the magnesium, preventing the adherence of the silver plate.

Our problem was to find a surface pretreatment that would provide an adherent basis for plating from an alkaline bath. In the past, many methods have been devised by which magnesium can be coated with such compounds as the oxide, chromate, dichromate, fluoride, or selenide. The methods involve either simple immersion or electrolysis. None of these methods has proven satisfactory for the plating of silver on magnesium.

Recently there was published, during the time this investigation was in progress, a method for the electrodeposition of nickel upon magnesium and magnesium alloys.<sup>3</sup> This method involves a special preliminary treatment of the magnesium surface followed by plating in a boro-fluoride electrolyte.

## Experimental

The cyanide-carbonate silver plating bath commonly used for silver plating is not suited to the electrodeposition

of silver on magnesium. The deposits are loose and the basis metal becomes badly pitted during plating. Elimination of the carbonate from this bath tends to reduce the pitting and to partially eliminate the reaction of the electrolyte with the cathode but does not produce satisfactory silver deposits.

The magnesium metal used in this research was produced by electrothermic reduction, distilled, extruded and hot rolled. Cathodes measuring 2.5 cm. x 4 cm. x 0.5 cm. were plated in glass cells containing 200 ml. of electrolyte. Anodes were 999+ fine silver.

During the course of this work, it was observed that rough cathodes pitted more readily than smooth cathodes; hence the magnesium was polished to a bright finish before treatment and plating. For polishing we used successively finer emery paper, finishing on a cloth-covered wheel with six-hour treatment with alumina and liquid soap.

**Degreasing.** Vapor degreasing methods proved unsatisfactory, resulting in non-adherent silver plate. Satisfactory cleaning was accomplished by the action of alkaline baths that were employed later in the preplating cycle.

**Preparation of the Metal Surface.** The following procedure is satisfactory for preparing the magnesium surface for silver plating.

1. **Cathodic cleaning** in a bath of the following composition:  
Sodium carbonate . . . . . 56 g./L ( 7.5 oz./gal.)  
Trisodium phosphate . . . 110 g./L (14.7 oz./gal.)  
Sodium hydroxide . . . . . 28 g./L ( 3.7 oz./gal.)  
Ammonium lauryl sulfate 2 to 8 g./L (0.2 to 1.0 oz./gal.)

This cleaning operation is carried out for 1 to 2 minutes at a current density of 20 amp./dm.<sup>2</sup> (216 amp./sq. ft.) at a temperature of 60° to 90° C.

2. **Cold water rinse.**

3. **Anodic treatment** in a bath of the following composition:  
Trisodium phosphate  
(12 hydrate) . . . . . 250 g./L (33.4 oz./gal.)

This anodic treatment is carried out at 60° to 80° C. using a current density of 30 to 40 amp./dm.<sup>2</sup> (275 to 375 amp./sq. ft.) for 3 to 6 minutes. A gray film is formed on

(Concluded on page 274)

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# Glycerine Usage In Metal Treatment

By Georgia Leffingwell, Ph.D., and Milton A. Lesser, B.Sc.

**I**N METAL treatment and fabrication, glycerine has long had many uses. However, recent years have brought new applications for this versatile fluid, and the literature, both technical and industrial, reflects the growing use of glycerine in such diverse fields as electrolytic processes, metal quenching and tempering preparations, molds, soldering fluids and fluxes, metal cleaning and metal polishing compositions, special lubricants and metallurgical analytic processes.

In the metals field the value of glycerine derives largely from its unique combination of useful physical properties. A clear, viscous, syrupy, heavy, hygroscopic fluid, glycerine is fully miscible with water and alcohol in all proportions. An excellent solvent for many substances, it is immiscible with benzene and similar organic solvents and certain oils. Its high boiling point and low freezing point make this fluid most useful over a wide range of temperatures.

## Plating and Stripping

Glycerine has long been employed in electroplating and stripping processes, but more recently it is finding wide use in electrolytic polishing procedures and in the anodic treatment of aluminum. Standard, glycerine-containing solutions, such as those used for the electrodeposition of nickel and cadmium, have long been in use<sup>1</sup>. The studies of Mathers and Guest<sup>2</sup> have shown that glycerine increases the throwing power of zinc sulfate baths within a wide range of current densities. Moreover, it was found that the zinc deposits seemed to be improved in quality.

An interesting example of the use of glycerine is given in a recent foreign patent<sup>3</sup> covering a procedure for the electrodeposition of tungsten alloys. According to the patent claims, lustrous tungsten-iron alloys are obtainable by electrolyzing a solution such as the following:

Sodium tungstate	400 g.
Sodium pyrophosphate (dibasic)	400 "
Potassium chloride	100 "
Ammonium fluoride	40 "
Potassium ferrocyanide	2 "
Potassium hydroxide	100 "
Water	600 cc.
Ethyl alcohol	80 "
Glycerine	80 "

Electrolysis is preferably effected at 80°C., at a current

density of 0.12 amp./sq. cm. After deposition on a metal, the alloy may be heated to 1000-1200° or more, to cause it to diffuse into the surface.

The reverse of electrodeposition, metal stripping processes, likewise utilize glycerine in standard formulas. A case in point is the following solution, used for stripping nickel from steel:

Sulfuric acid	2 gal.
Glycerine	2 oz.
Water	1 qt.

This solution is used at room temperature, with a reverse current of six volts, employing lead cathodes. The rate of stripping may be increased by adding more water, but this addition will increase the tendency to pit<sup>4</sup>.

Precious metals may similarly be stripped one from the other by the use of glycerine-containing solutions. Thus, Kushner<sup>5</sup> suggests the following solution for stripping gold from silver:

Hydrochloric acid (concentrated)	4 oz.
Glycerine	1 fl. oz.
Water	1 gal.

Use the solution cold, at six volts with carbon cathodes. Avoid agitation since this tends to remove the thin protective film of silver chloride that forms on the base metal.

Electrolytic processes for polishing steel have found advantageous application for glycerine. Most significant in this connection is the work of Uhlig<sup>6</sup>, who reported that, by the use of a glycerine-phosphoric acid mixture, electrolytic polishing of 18/8 stainless steel is less expensive and less time-consuming than mechanical procedures. The optimum polish was obtained by an electrolyte consisting of:

Phosphoric acid	42% by weight
Glycerine	47 " "
Water	11 " "

at 100° C. or more and 0.1 amp./sq. in. In this process, one function of glycerine is to prevent attack of the chemical anode by chemical action, independent of anode attack. Other steels could be polished in the same electrolyte, but the operating conditions would have to be somewhat modified. It has also been found that nickel, copper, chrome steel, and mild steel can be polished in this way<sup>7</sup>.

Glycerine has an established place in processes for anodizing aluminum in which corrosion-resistant oxide coatings, that can readily be colored with appropriate dyes or other means, are formed on this metal. Of the several procedures employed, the sulfuric acid bath, containing an inhibitor

such as glycerine, is undoubtedly the most popular, since it gives a white, transparent, hard oxide coating which is an integral part of the metal<sup>8</sup>. In the role of an inhibiting agent, glycerine serves to prevent excessive etching and helps to produce a smooth, white surface. It is employed as the retarder or inhibitor in several standard processes including the Alumilite, Tennents and Anotint procedures, all of which employ sulfuric acid<sup>9</sup>.

From the patent literature, however, it is evident that the use of glycerine is not limited to methods employing only sulfuric acid. This fluid is also used in anodic coating methods for aluminum which employ caustic soda<sup>10</sup>, chromic acid<sup>11</sup> and oxalic acid<sup>12</sup> in conjunction with other substances.

### Cleaning and Pickling

According to Shoemaker's<sup>13</sup> patent, the value of glycerine may be extended to include its employment in processes for protecting metals after the pickling process. In order to neutralize the adhering acid and to protect the surface from rusting, this patent specifies that the metal be rinsed, after pickling, in solutions containing caustic alkali, glycerine, and a wetting agent such as sodium metaphosphate or sodium hexa-metaphosphate.

Other processes for treating and cleaning metal surfaces likewise employ the advantages of glycerine. Thus, according to a comprehensive European report<sup>14</sup>, a cheap solution for removing rust and forge scale from iron, steel and sheet metal consists of:

Sodium hydroxide.....	750 g.
Soda crystals.....	875 g.
Potassium permanganate or potassium manganate.....	10 g.
Water .....	12 L.

For cleaning of dirt, oil, colors, and the like, a little glycerine is added without affecting the derusting action. After a few minutes in the solution, the rust dissolves and can be wiped off; the metal underneath remaining uncorroded and possessing a thin coating which protects it from rust for a short time.

When cleaning alone is desired, the following solution is recommended:

Soda crystals.....	4 Kg.
Sodium hydroxide.....	250 g.
Glycerine .....	125 g.
Potassium manganate.....	16 g.
Water (hot) .....	120 L.

Mason<sup>15</sup> has also described an interesting composition for removing rust from metals, consisting of:

Oxalic acid.....	20 parts
Phosphoric acid.....	20 "
Glycerine .....	10 "
Ground silica .....	50 "

This paste is placed on the ordinarily inaccessible surfaces and after allowing them to stand in a warm place for 15-20 minutes, can then be washed off.

Glycerine, however, is not limited to use on cleaning ferrous metals. One patent<sup>16</sup>, for example, specifies the use of the following solution for cleaning magnesium and magnesium-base alloy surfaces:

Water .....	70 parts
Sulfuric acid.....	5 "
Glycerine .....	25 "

In passing, it should also be pointed out that glycerine is a frequent constituent of standard polishing compositions for various metals<sup>17, 18</sup>. Of interest in this connection is Pyler's<sup>19</sup> suggestion that when heavy accumulations are encountered on stainless steel, iron-free emery of fine mesh, with glycerine as a lubricant, will give excellent cleansing results.

### Soldering

Soldering fluids and pastes are compositions that frequently utilize the properties of glycerine, particularly its ability to "wet" metal surfaces. Many glycerine-containing soldering fluids are available and easily prepared, but the following, with a wide range of usefulness, is quite typical:

Zinc chloride.....	15%
Glycerine .....	25 "
Water .....	60 "

This combination is said<sup>20</sup> to be satisfactory for use on copper, brass, steel, terne plate, tinned steel, "Monel" metal and others.

The following soldering fluid is rather interesting in that no metallic salts are used in its formulation (1):

Lactic acid .....	1 part
Glycerine .....	1 "
Water .....	8 parts

According to Watkins' recent discussion<sup>21</sup>, soldering pastes facilitate soldering by combining the solder with the flux in one preparation. Such products generally consist of powdered tin or solder or solder mixed with zinc chloride and ammonium chloride, glycerine and water. He states that the proportion of flux varies between 10 and 50 per cent. Two glycerine-containing soldering preparations are included among the typical analyses of five such products given by this writer.

Gonser and Slowter<sup>22</sup> point out that some patented rosin-base fluxes attempt to combine the speed of an active acid flux with the protective action afforded by a rosin residue. As an example, they describe a rosin flux containing 1.5 per cent aniline hydrochloride and 1.5 per cent of a solvent such as glycerine. This composition is said to release sufficient hydrochloric acid by decomposition to speed the fluxing action, and yet to be comparatively non-corrosive.

Somewhat along these lines are the specifications given in a British patent<sup>23</sup> which claims that soldering fluxes may be prepared by mixing together phosphoric acid; a mixture of powdered ammonium chloride and a liquid or pasty medium such as glycerine, and a material consisting wholly or mainly of rosin.

### Hot Dipping

Glycerine also plays an important part in galvanizing or hot-dip tinning processes<sup>24</sup>. Back in 1931, Imhoff<sup>25</sup> explained the function of glycerine in such procedures as follows: "From a practical standpoint, at least so far as the galvanizer is concerned, the important features in the chemistry of using glycerine as a flux conditioner are that the glycerine provides a medium for supplying and holding water in the flux. Water is absolutely essential as the medium through which the flux can act and also through which the chemical reactions can go on. It also provides the fluidity necessary in a good working flux so that it can

slip off the work easily and not burn on to it, as a dry, cakey flux usually does". This authority also pointed out that a glycerine flux is a thick, more or less viscous flux. It is much heavier than fluxes made up with other conditions and is therefore considered excellent for use for heavier work.

In a discussion of the hot-tinning of fabricated articles, Daniels<sup>26</sup> notes that the usual zinc chloride or zinc chloride-ammonium chloride solutions used for fluxing copper wire prior to tinning are being replaced by tin (stannous) chloride and glycerine, or lactic acid, or glycerine or a mixture of the latter two.

### Etching

Glycerine is also a frequent ingredient of the etching solutions that find such wide use in metallurgical microscopic analyses. Thus, for etching aluminum and its alloys, Egeberg and Promisel<sup>27</sup> recommend that the freshly polished, cleaned specimens be warmed in hot water and treated immediately with the following etching solution:

Nitric acid	1 vol.
Hydrofluoric acid	2 "
Glycerine	3 "

This is very similar to the etching agent suggested by Romig and Rowland<sup>28</sup> to reveal the iron-tin alloy layer on commercial hot-dipped tin plate, consisting of:

Nitric acid	1 drop
Hydrofluoric acid	2 drops
Glycerine	25 ml.

(Mix well)

For white metals such as tin, lead, antimony, bismuth and their alloys, as well as Britannia metal, Egeberg and Promisel advocate that these metals be etched with the following solution:

Nitric acid	1 vol.
Acetic acid	3 "
Glycerine	15 "

Aqua regia in glycerine is a standard etching agent for the microscopic study of stainless steels<sup>29</sup>.

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(Concluded from Page 271)

the surface of the magnesium which is adherent, smooth and stable.

#### 4. Cold water rinse.

#### 5. Copper strike in a bath of following composition:

Copper cyanide	5 g./L (0.67 oz./gal.)
Potassium cyanide	100 g./L (13.3 oz./gal.)

This strike is at 25 amp./dm.<sup>2</sup> (270 amp./sq. ft.) current density, for 1 to 30 seconds depending on the condition of the metal surface or until the magnesium is covered with copper. The temperature is 20° to 25° C.

#### 6. Cold water rinse.

#### 7. Plating in a bath of the following composition:

Silver cyanide	8.7 g./L (1.1 oz./gal.)
Potassium cyanide	11.2 g./L (1.5 oz./gal.)
Boric acid	10 to 30 g./L (1.3 to 4 oz./gal.)

The anode-to-cathode area ratio was 1:6 because larger anode areas shortened the life of the bath and produced discolored plate. The current density was 0.1 to 0.4 amp./dm.<sup>2</sup> (1.8 to 4.3 amp./sq. ft.) and the temperature was 20° to 25° C.

The silver electrodeposited on magnesium by this treatment was in the form of white, smooth, hard, adherent silver films. Plates which were allowed to lie exposed to the air in the laboratory for several months remained adherent and appeared the same as when plated, except for a normal amount of tarnishing. These films were found to be porous and were not, therefore, suitable for protection of the magnesium surface.

### Discussion

The problem of plating an active metal such as magnesium is largely one of preplating treatment. In this research, the fluoride treatment described by Loose<sup>3</sup> was tried but it was not possible to secure desirable silver plates following our preplating operations. This appeared to be due to an action taking place between the fluoride deposit on the magnesium and the electrolyte.

Although heavy silver plate (1.6 mm. and thicker) was quite readily removed from the magnesium after plating, the films (not over 2.5  $\mu$  or 0.0001 in.) were very adherent when plated as described. It may be possible by first plating more heavily with copper, then buffing and plating with silver, to produce less porous silver deposits. However, this appeared to involve so much additional treatment as to make it unworthy of further consideration.

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# Dictionary of Metal Finishing Chemicals

**Calcium Hydroxide:**  $\text{Ca(OH)}_2$ . Mol. wt. 74.10. Dry white powder. Also known as Lime Hydrate, Calcium Hydrate, Slaked Lime, Hydrated Lime. Decomposes when heated. Very slightly soluble in water. Soluble in acids and ammonium chloride solutions. Grades: Technical, Purified, U. S. P., C. P. Containers: Bottles, Cartons (1, 5 lb.); Tins (1, 5, 10, 25 lb.); Kegs (100 lb.); Barrels (200, 250, 275 lb.); Paper Bags; Bulk.

**Calcium Hypochlorite:**  $\text{CaOCl}_2$ . Mol. wt. 126.99. White powder with strong odor of chlorine. Also known as Calcium Chlorohypochlorite, Bleaching Powder, Calcium Oxychloride, Hyperchlorite of Lime, Chlorinated Lime, Chloride of Lime. Decomposes when heated and when dissolved in water or acids. Grades: Technical, U. S. P. Containers: Bottles (1, 5 lb.); Cans (10 lb.); Drums (58, 100, 130, 300, 325, 453, 800 lb.); Barrels (415 lb.).

**Calcium Oxide:**  $\text{CaO}$ . Mol. wt. 56.08. Sp. gr. 3.40. M. P.  $2570^\circ\text{C}$ . White lumps, granules or powder. Also known as Lime, Quicklime, Burnt Lime, Unslaked Lime. Decomposes in water. Soluble in acids and alcohol. Grades: Technical, U. S. P., N. F., C. P. Containers: Bottles (1, 5 lb.); Cans (1, 5, 10 lb.); Kegs (25, 50 lb.); Bags (25, 50, 100 lb.); Drums (100, 300, 330 lb.); Barrels (200, 300, 400 lb.).

**Calcium Oxychloride:** See Calcium Hypochlorite.

**Calcium Sulfate:**  $\text{CaSO}_4$ . Mol. wt. 136.14. Sp. gr. 2.96. M. P.  $1450^\circ\text{C}$ . Rhombic or monoclinic colorless crystals. Also known as Anhydrous Calcium Sulfate, Calcium Sulfate Anhydrite. Very slightly soluble in water. Soluble in acids, thiosulfate solutions and solutions of ammonium salts. Grades: Technical, Purified, C. P. Containers: Bottles, Cartons (1, 5 lb.); Tins (1, 10 lb.); Kegs (25, 50, 100 lb.); Bags (100 lb.); Barrels (300 lb.); Bulk.

**Calcium Sulfate:**  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ . Mol. wt. 145.15. White powder. Also known as Calcined Calcium Sulfate, Plaster of Paris, Partially Dehydrated Gypsum. See  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . Very slightly soluble in water. Soluble in acids, thiosulfate solutions and solutions of ammonium salts. Grades: Technical. Containers: Cans (1, 5, 10, 50 lb.); Bags (10, 100 lb.); Kegs (25, 50, 100 lb.); Barrels (225, 300 lb.).

*Metal Finishing continues the dictionary of chemicals for its industry with this, the fifth installment.*

*This will remain a regular monthly feature until completed.*

**Calcium Sulfate:**  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . Mol. wt. 172.17. Monoclinic, colorless crystals or white powder. Also known as Gypsum. Very slightly soluble in water. Soluble in acids, thiosulfate solutions and solutions of ammonium salts. Grades: Technical, C. P., lumps and powder. Containers: Bottles, Cartons (1, 5 lb.); Tins (1, 10, 50 lb.); Kegs (25, 50, 100 lb.); Bags (100 lb.); Barrels (222 lb.); Bulk.

**Calcium Sulfate, Anhydrite:** See Calcium Sulfate— $\text{CaSO}_4$ .

**Calcium Sulfate, Anhydrous:** See Calcium Sulfate— $\text{CaSO}_4$ .

**Calcium Sulfate, Calcined:** See Calcium Sulfate— $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ .

**Calcium Sulfide:**  $\text{CaS}$ . Mol. wt. 72.14. Sp. gr. 2.8. Colorless to light gray cubes, lumps. Also known as Sulfurated Lime, Calcic Liver of Sulfur and Liver of Lime. Very slightly soluble in water. Decomposes in acids and when heated to a high temperature. Grades: Technical, U. S. P. Containers: Bottles (1, 5 lb.); Tins (25 lb.); Bags (100 lb.); Drums (100, 200, 250, 300, 400 lb.).

**Caliche:** See Sodium Nitrate.

**Calomel:** See Mercurous Chloride.

**Camphor, Tar:** See Naphthalene.

**Candlilla Wax:** Sp. gr. 0.983. M. P.  $67^\circ\text{C}$ . Yellowish brown opaque to translucent solid. Soluble in turpentine and chloroform. Grades: Technical. Containers: Cartons (1, 5 lb.); Boxes (100 lb.); Bags (200 lb.).

**Cane Sugar:** See Sucrose.

**Carbamide:** See Urea.

**Carbide:** See Calcium Carbide.

**Carbinol:** See Methyl Alcohol.

**Carbolic Acid:** See Phenol.

**Carbon:** C. At. wt. 12.010. Sp. gr. 1.8-2.1 amorph.; 2.25 graph., 3.51 diamond. Amorphous, cubic black crystals; colorless cubic crystals. The amorphous black carbon exists in many forms such as charcoal, coal, lampblack, etc. The cubic crystals are graphite. The colorless crystals are the diamond form.

**Carbon Bisulfide:** See Carbon Disulfide.

**Carbon Dioxide:**  $\text{CO}_2$ . Mol. wt. 44.01. Sp. gr. 1.53 gas (air=1); 1.06 liquid; 1.56 solid. Colorless, odorless gas; colorless, volatile liquid; white solid. Also known as Carbonic Acid, Carbonic Gas. Slightly soluble in water and alcohol. Grades: Technical. Containers: Liquid in cylinders. Solid in boxes ( $\frac{1}{2}$ , 2 $\frac{1}{2}$ , 6, 20, 25, 50, 150 lbs.).

**Carbon Disulfide:**  $\text{CS}_2$ . Mol. wt. 76.13. Sp. gr. 1.261 M. P.  $-111.6^\circ\text{C}$ . B. P.  $46.3^\circ\text{C}$ . Colorless liquid with disagreeable odor in the commercial product. Also known as Carbon Bisulfide. Very slightly soluble in water. Soluble in alcohol, ether. Grades: Technical, U. S. P., Redistilled, C. P. Containers: Bottles, Cans (1, 5 lb.); Drums (5, 10, 55, 50, 100, 110 gal.); Tank Cars.

**Carbon, Gas:** Also known as Retort Carbon, Retort Graphite, Glance Coal, Metallic Carbon. A very dense form of carbon from the upper parts of coal-gas retorts. Very hard. Good conductor of heat and electricity.

**Carbon, Metallic:** See Carbon, Gas.

**Carbon, Mineral:** See Graphite.

**Carbon Monoxide:**  $\text{CO}$ . Mol. wt. 28.01. Sp. gr. 0.96716 (air=1); M. P.  $-207^\circ\text{C}$ . B. P.  $-192^\circ\text{C}$ . Colorless, odorless gas. Poisonous. Very slightly soluble in water. Soluble in alcohol, acetic acid, cuprous chloride solutions.

**Carbon Nitride:** See Cyanogen.

**Carbon, Retort:** See Carbon, Gas.

**Carbon Tetrachloride:**  $\text{CCl}_4$ . Mol. wt. 153.838. Sp. gr. 1.595. M. P.  $-22.8^\circ\text{C}$ . B. P.  $76.7^\circ\text{C}$ . Colorless, non-inflammable liquid yielding heavy vapor. Also known as Tetrachloromethane, Perchloromethane. Very slightly soluble in water. Infinitely soluble in alcohol, ether, benzene. Grades: Technical, Purified, U. S. P., C. P. Containers: Cans (1 qt., 1, 5, 10 gal.); Bottles (1, 5, lb.); Demijohns (25, 65 lb.); Drums (50, 52 $\frac{1}{2}$ , 55, 110 gal.); Carboys (150 lb.); Tank Cars.

**Carbonic Acid:** See Carbon Dioxide. Strictly speaking, Carbonic Acid is  $\text{H}_2\text{CO}_3$  which is a solution of Carbon Dioxide in water. Carbonic Acid exists only in solution form.

**Carbonic Gas:** See Carbon Dioxide.

**Carborundum:** Proprietary name for Silicon Carbide, abrasive, q. v.

**Carnauba Wax:** Sp. gr. 0.995-0.999. M. P. 80-87°C. Hard, amorphous light yellow or greenish brittle lumps. Also known as Brazil Wax. Insoluble in water. Soluble in hot alcohol and alkalis, ether. Grades: Technical. Containers: Bags (1, 5, 100 lb.); Boxes 25, 100 lb.).

**Caustic:** See Sodium Hydroxide.

**Caustic Baryta:** See Barium Hydroxide.

**Caustic Lime:** See Calcium Hydroxide.

**Caustic, Lunar:** Fused Silver Nitrate, q. v.

**Caustic Oil of Arsenic:** See Arsenic Chloride.

**Caustic Potash:** See Potassium Hydroxide.

**Caustic Soda:** See Sodium Hydroxide.

**Caustic, White:** See Sodium Hydroxide.

**Causticized Ash:** Mixture of soda ash and caustic soda, designated by caustic soda content and with alkalinity between soda ash and caustic soda.

**Ceresin:** Sp. gr. 0.92-0.94. M. P. 74-80°C. White, odorless, tasteless wax. Also known as Cerosin, Cerin, Mineral Wax, Earth Wax, Purified Ozokerite. Grades: Technical. Containers: Boxes, Cartons (1, 5, 25, 50, 100 lb.); Bags (100 lb.).

**Ceric Sulfate:**  $\text{Ce}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ . Mol. wt. 404.31. Rhombic, yellow crystals. Also known as Cerium Sulfate. Very soluble in water. Grades: Technical, Purified. Containers: Bottles (1 oz., 1 lb.); Boxes.

**Cerin:** See Ceresin.

**Cerium:** Ce. At. wt. 140.13. Sp. gr. 6.90. M. P. 815°C. Steel gray metal. Powder form also. Ductile. Malleable. Insoluble in water. Soluble in dilute acids. Grades: Technical. Containers: Bottles (1 g., 1 oz.,  $\frac{1}{4}$  lb.); Boxes.

**Cerium Sulfate:** See Ceric Sulfate.

**Cerosin:** See Ceresin.

**Cesium:** Cs. At. wt. 132.91. Sp. gr. 1.87. M. P. 28.5°C. B. P. 670°C. Silvery white metal. Ductile. Decomposes in water liberating hydrogen gas. Sol-

uble in acids, alcohol. Grades: Technical. Containers: Bottles ( $\frac{1}{2}$ , 1 g.).

**Cetylacetic Acid:** See Stearic Acid.

**Cetylic Acid:** See Palmitic Acid.

**Chalk:** Natural form of Calcium Carbonate, q. v. Grades: Technical, U. S. P., lumps, powder. Containers: Bottles (1, 5 lb.); Cartons (1, 5, 25, 50 lb.); Kegs (50, 100 lb.); Barrels (200 lb.).

**Chalk, Precipitated:** See Calcium Carbonate.

**Chamber Acid:** A form of Sulfuric Acid made by the chamber process. See Sulfuric Acid.

**Charcoal:** Carbon residue from roasting at carbonizing temperatures various organic materials from which it takes its name such as animal, blood, coconut, sugar, wood (maple, willow), etc. Powder, lumps, granules, blocks, sticks. Grades: Technical, C. P., N. F., U. S. P. Containers: Cartons (1, 5 lb.); Boxes (25, 50 lb.); Kegs (100 lb.); Barrels (225 lb.).

**Chile Niter:** See Sodium Nitrate.

**Chile Nitrate:** See Sodium Nitrate.

**Chile Saltpeter:** See Sodium Nitrate.

**Chilean Niter:** See Sodium Nitrate.

**Chilean Nitrate:** See Sodium Nitrate.

**Chilean Saltpeter:** See Sodium Nitrate.

**Chi'i Niter:** See Sodium Nitrate.

**Chili Nitrate:** See Sodium Nitrate.

**Chili Saltpeter:** See Sodium Nitrate.

**China Clay:** See Kaolin.

**Chloracetic Acid:**  $\text{CH}_2\text{ClCOOH}$ . Mol. wt. 94.591. Sp. gr. 1.58. Colorless, rhombic crystals. Also known as Monochloroacetic Acid, Chloretanoic Acid. Very soluble in water. Soluble in ether, alcohol, chloroform, benzol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Barrels.

**Chlorauric Acid:**  $\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$ . Mol. wt. 394.1. Yellow, deliquescent needles. Also known as Acid Gold Chloride. Material sold to the trade contains about 50% gold. Soluble in cold water, alcohol, ether. Very soluble in hot water. Decomposes when heated. Grades: Technical, C. P. Containers: Bottles (15 g.,  $\frac{1}{8}$ , 1,  $2\frac{1}{2}$ , 4, 5, 10, 16, 50 oz.).

**Chloretanoic Acid:** See Chloracetic Acid.

**Chloride of Lime:** See Calcium Hypochlorite.

**Chlorinated Lime:** See Calcium Hypochlorite.

**Chlorinated Soda:** See Sodium Hypochlorite.

**Chlorine:**  $\text{Cl}_2$ . Mol. wt. 70.914. Sp. gr. 2.49 gas (air=1); 1.56 liquid. M. P. -102°C. B. P. -33.7°C. Greenish yellow gas or liquid with sharp odor. Poisonous. Slightly soluble in water. Soluble in alkalis. Grades: Technical. Containers: Liquid in cylinders. (1, 5, 15, 50, 100, 150, 2000 lb.); Tank cars.

**Chloroform:**  $\text{CHCl}_3$ . Mol. wt. 119.389. Sp. gr. 1.499. M. P. -63.5°C. B. P. 61.2°C. Clear, colorless liquid. Also known as Trichloromethane, Formyl Trichloride, Methyl Trichloride. Volatile. Non-inflammable. Slightly soluble in water. Infinitely soluble in alcohol and ether. Soluble in benzene, acetone. Grades: Technical, U. S. P., U. S. P.—anesthesia, C. P. Containers: Bottles (1, 5, 7 lb.) Cans (1, 5, 10, 15, 25, 50 lb.) Drums (50, 100, 120, 650 lb.).

**Chlorohydric Acid:** See Hydrochloric Acid.

**Chloroplatinic Acid:**  $\text{H}_2\text{PtCl}_6 \cdot 6\text{H}_2\text{O}$ . Mol. wt. 518.08. Sp. gr. 2.431. M. P. 60°C. Reddish brown, deliquescent, prismatic crystals. Also known incorrectly as Platinum Chloride. Very soluble in water. Soluble in alcohol, ether. Grades: Technical; Purified; C. P.; crystals; solution, 5, 10%. Containers: Glass bottles (1 g.;  $\frac{1}{8}$ ,  $\frac{1}{4}$ , 1 oz.).

**Chrome Alum:** See Chromic Potassium Sulfate.

**Chromic Acetate:**  $\text{Cr}(\text{C}_2\text{H}_3\text{O}_2)_3 \cdot \text{H}_2\text{O}$ . Mol. wt. 247.16. Grayish green powder or bluish green paste. Also known as Chromium Acetate. Soluble in water. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Cans (10, 25 lb.); Kegs (100 lb.); Barrels (400, 450 lb.).

**Chromic Acid:**  $\text{CrO}_3$ . Mol. wt. 100.01. Sp. gr. 2.7. M. P. 196°C. Reddish brown plates or rhombic, deliquescent crystals. Also known as Chromium Trioxide, Chromic Anhydride. Solubility, 166 at 15°C. 207 at 100°C. Soluble in ether, alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Cans (1, 5, 25 lb.) Jars (25 lb.); Drums (50, 100, 200, 400 lb.).

**Chromic Ammonium Sulfate:**  $\text{Cr}_2(\text{NH}_4)_2(\text{SO}_4)_4 \cdot 24\text{H}_2\text{O}$ . Mol. wt. 956.72. Sp. gr. 1.72. M. P. 94°C. Cubic, green crystals or granules. Also known as Chromium Ammonium Sulfate. Solubility, 21 at 25°C., 33 at 40°C. Soluble in dilute acids and alcohol. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.).

(To be continued next month)

**Abbreviations:** Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

# Recent Developments in Zinc Plating

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IN presenting this paper to the Chicago Branch of the A.E.S. on "Recent Developments in Zinc Plating," emphasis will be placed on practice rather than theory regarding the solutions and treatments to be discussed. I shall not attempt to cover the whole field of zinc plating but rather tell you about some important developments and observations which are relatively new or which have assumed immediate importance.

Ten years ago there was not a great deal of choice for a manufacturer who wished to protect ferrous articles against corrosion with zinc. He could choose hot galvanizing for many bulky articles where the thickness of the coating would not interfere with operational use. For many purposes, however, galvanizing was either too expensive, it lacked eye appeal, or, from an engineering standpoint, it could not meet dimensional tolerances.

When the manufacturer turned to electrodeposited coatings, the choice lay between *acid zinc* and *cyanide zinc deposits*. Acid zinc solutions produced frosty white deposits which often had relatively low protective value. The throwing power of acid solutions was amazingly poor. Furthermore the pH of acid solutions was unstable, despite attempts to employ buffers. The unalloyed zinc anodes used were chemically attacked, resulting in large metal losses. About the only favorable characteristics of acid baths, outside of large scale strip or wire plating, were that the solution was inexpensive, and that it was a less complex solution to control.

Turning to cyanide zinc solutions as they were used ten years ago, there was little choice offered. Deposits from the 8-3-7\* or 8-5-7 solutions ranged from dull-grey to dull-white. As the effects of impurities and methods for the removal of these impurities were not fully known, the results were often disappointing in comparison with bright cadmium coatings, the use of which was at that time expanding rapidly. In comparison with cyanide zinc solutions, bright cadmium solutions produced coatings which were pleasingly lustrous and which had less tendency to stain or tarnish; as a result articles coated with cadmium were more salable. Furthermore, cadmium solutions were much less difficult to operate and control. Despite its relatively high cost, cadmium gradually supplanted zinc in thousands of applications.

\* Zinc cyanide, sodium cyanide and sodium hydroxide, in ounces per gallon.

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It is interesting to observe that bright zinc processes were introduced several years ago at about the time that the price of cadmium skyrocketed because of an unbalanced supply in the face of increasing demands for cadmium, not only for use in plating but for use in automobile bearings. In view of the excellent results that could be obtained with bright zinc processes, if handled properly, it was my prediction in an article published at that time that the use of zinc plating would expand and that cadmium would never again enjoy a virtual monopoly as a finish on consumers' goods at all, and many other articles where corrosion resistance was of prime importance. Since then, the tests made by the joint committee of the A.S.T.M. and A.E.S. have demonstrated that zinc coatings have almost identical protective value as compared with cadmium coatings of equal thickness in all but salt spray tests which, incidentally, do not represent actual exposure conditions, even in a marine atmosphere.

Bright zinc solutions have several advantages over ordinary dull-plating solutions aside from the lustre of deposits. Some of the bright solutions are capable of being operated at current densities of 60 amp./sq. ft. without agitation. This more than compensates for the increased time required to deposit a definite thickness of zinc in comparison with cadmium. By selecting a lower current density, well within the bright range, for example: 45 amp./sq. ft., irregularly shaped and protruding articles can be plated without danger of "burning" the exposed portions. In ordinary unagitated zinc solutions, the maximum cathode current density is around 25 amp./sq. ft., with a risk of "burning" exposed areas if this limit is exceeded.

Because of their sensitivity to impurities, the operation of bright zinc solutions has taught us a great deal about solution cleanliness, the use of high purity alloy anodes, the importance of proper anode current density, and chemical control.

Bright zinc deposits have much less tendency to stain during rinsing and drying operations and when exposed in an unfavorable environment. This is especially true of forgings or castings that have been sandblasted before entering the plating cycle.

While ordinary zinc solutions have a poorer throwing power than bright cadmium solutions, bright zinc solutions, approach cadmium baths in this respect. This characteristic is probably connected with an observable increase in cathode polarization.

Another advantage of bright zinc baths over ordinary zinc solutions lies in their ability to cover the surface being plated more completely. This is especially true as applied



to castings. This special application will be discussed later.

Under wartime conditions, it is not necessary to produce goods with bright, attractive finishes as our customers today are primarily interested in how the articles will function on the battlefronts. Bright zinc solutions would therefore appear to be unessential. In view of the advantages given above, combined with ease of inspection, it is interesting to note that all of the conversions from cadmium to zinc that we have made within the past six months have involved bright zinc or semi-bright zinc processes.

A semi-bright zinc solution has been developed which has a wide current density range and excellent throwing power. It is therefore applicable to the plating of a wide variety of war goods. Many conversions from cadmium to zinc have been made and several full automatic conveyors will be operating shortly using a semi-bright solution. The formula for this bath is:

Zinc cyanide .....	8 oz./gal.
Sodium cyanide .....	5 "
Sodium hydroxide .....	12 "
Zinc addition agent S-B .....	0.8 "

The zinc addition agent is composed of a balanced mixture of sodium fluoride, gum Arabic, cystine and other amino acid derivatives. Sodium fluoride and gum Arabic additions are mentioned in several textbooks. These two materials can be used without amino acid derivatives, with some loss in lustre. Although the mixed addition agent has a brightening effect upon the deposit, we prefer to term it "addition agent" rather than a "brightener." The effective life of the addition agent in the solution, unlike many brighteners, is from one to three months, depending upon the degree of drag-out.

In unagitated solutions, the cathode current density range is 10-40 amp./sq. ft. Maximum brightness is obtained if the solution temperature is maintained at 70-75° F. Within this temperature range, the cathode current efficiency at 30 amp./sq. ft. is 86%. The deposits are somewhat lustrous as they are taken from the plating bath. A momentary dip in a 1/2% nitric acid solution increases the brightness and gives the deposit a lighter tone.

If the semi-bright solution is operated at about 100° F., the cathode efficiency is increased to 95% but the deposits lose a slight degree of brightness. When bright dipped, the plated surface acquires a pleasing, satin-like lustre.

The semi-bright solution should be prepared and operated with the care usually taken with bright solutions in respect to heavy metal contaminants. A treatment with Standard Zinc Dust No. 122 or No. 22 in the proportion of one pound per 100 gallons is advisable when preparing a new bath. Should contamination occur later, as indicated by bright-dipped work turning black or brown, the zinc dust treatment will quickly restore the solution to its original condition.

Semi-bright deposits can be successfully Bonderized, Cronaked, blackened or heat-relieved. The deposits produced are unalloyed electrolytic zinc having excellent protective value. Zinc-aluminum alloy anodes are recommended. The use of mercury-containing anodes is not permitted in solutions producing work for many ordnance purposes.

In view of the many conversions of plating solutions that are being made from cadmium to zinc, I should like

to digress for a moment to discuss the technique of converting. In plants where cadmium deposits have been coming from the solution bright, and where light-colored, bright and semi-bright coatings must be maintained during conversion, my advice is: "do not convert" but rather set aside the cadmium solution, thoroughly clean the plating tank or barrel apparatus, and then prepare an entirely new zinc solution.

If this procedure is not permitted, or if off-colored deposits will be accepted temporarily, the conversion can be accomplished by operating the solution with empty ball anode containers or steel anodes until the metal concentration decreases to 1.25 oz./gal., or even lower if the quality of deposits can be maintained. At this point add 3.0 oz./gal. of zinc oxide and 4.0 oz./gal. of sodium hydroxide. The use of oxides containing lead or copper should be avoided.

After the salts have dissolved, hang cleaned work or dummy steel sheets in the solution from the cathode rod, and then suspend zinc anodes from the anode rod with the current connected. By doing this, the cementation of cadmium sponge on the zinc anodes will be minimized. Until all of the cadmium is plated from the solution, it is advisable to apply current continuously. If it is not feasible to do this; for example, if the plant is not operating overnight, the anodes should be removed during the idle period.

When the bath has been operated for 8-12 hours at full capacity, test a portion of the solution with sodium sulphide and note the color of the precipitate. If the yellow color of cadmium sulphide is not evident, analyze the bath as a zinc solution and then add a sufficient quantity of zinc oxide, caustic soda, sodium cyanide and brightening agent to secure a bath of what ever composition is selected.

In converting to a semi-bright or bright process, a zinc dust treatment is advisable as heavy metal impurities, particularly copper, are usually present in harmful quantities. Treating with zinc dust before all cadmium has been plated out is only partially effective because of the cementation of cadmium on the zinc dust particles as described above.

The electroplating of malleable and grey iron castings with zinc has long been considered to be difficult and uncertain in results. Because of the low hydrogen overvoltage in an alkaline solution, there is a tendency for hydrogen gas to be discharged at the cathode in preference to zinc metal. We have had many castings sent to our laboratory for experimental zinc plating. Some of the castings can be completely covered with zinc without special attention; that is, by following the same procedure used in plating cold or hot rolled steel articles. Other castings with a similar physical appearance are only partially plated or refuse to accept any zinc whatsoever when processed in an identical manner. In some cases, these castings can be plated if the cleaning and pickling cycles are modified or if special plating baths and procedures are employed.

For several months we have been investigating this subject, first of all in an attempt to establish the reason why some castings plate and others do not. The physical appearance of castings as they come to the plating department apparently has little bearing upon their ability to accept zinc, presuming, of course that they have been thoroughly cleaned by sand or shotblasting to remove oxides.

sand and slag. Obviously a skin of foreign material will not only change the electrochemical characteristics but will lead to a poorly protective deposit. Sand and oxides can be removed by hydrofluoric, hydrochloric or sulphuric acid pickles, but pickling is a definitely unsatisfactory substitute for mechanical abrasive cleaning; in fact, prolonged pickling may, and usually does, produce undesirable surface characteristics.

Machined or ground castings can usually be zinc plated satisfactorily although we have noted exceptions, especially on threaded parts. The chances of obtaining good coverage in the case of machined articles are definitely better than on the sandblasted or shotblasted surfaces usually encountered.

Many modifications of plating procedures have been proposed in the past for overcoming the difficulties in zinc plating castings. In most cases, the use of a cadmium "flash" will change the electrode potential so that when the article is transferred to a zinc bath, plating will proceed in a normal manner.

### **Objections to Use of Cadmium Salts**

This procedure is satisfactory where the use of cadmium is permitted and where the metal is cleaned sufficiently to receive a continuous cadmium coating. There is a disadvantage in using this procedure, in that extra equipment and extra operations are required.

Another modification of plating procedure which is a favorite "trick" of many platers is to toss a small quantity of cadmium oxides or other cadmium salts into an alkaline zinc solution. The cadmium salt dissolves as a complex cadmium sodium cyanide and is plated out preferentially on the cathode, changing its potential toward the solution. Once a film of cadmium is deposited, zinc plating proceeds in a normal manner. This scheme is workable but has certain drawbacks. In the first place, the operator can never be certain that there is enough cadmium present at any given time to obtain the desired results. Its use must be watched carefully to obtain consistent results and to utilize the cadmium salts economically.

The second objection is that cadmium is replaced electrochemically by zinc in the bath. This results in the formation of cadmium sponge on the anodes. This reaction not only leads to cadmium metal loss but after a time has an objectionable effect at the cathode. From the standpoint of solution control, the cadmium sponge formed is the same as any dirt or suspended matter in the bath, and as such, will lead to rough deposits. This is particularly true in bright zinc plating.

The use of mercury salts in zinc solutions has been proposed to make possible the plating of iron castings. It is claimed that the addition of mercuric oxide to the bath in proportions up to 2% of the zinc content not only gives good coverage of zinc, but also increases the cathode efficiency and produces a whiter deposit. The improvements claimed cannot always be realized. Aside from this, we are of the opinion that at present the use of mercury in any form is discouraged. Furthermore, certain industries will not permit the use of mercury or mercury salts because of the possibility of amalgamation and also the season cracking of brass parts in assemblies. In addition to these objections, the process may not be economical under some conditions of operation because of large mercury losses.

Another method of securing satisfactory coverage is to

first acid zinc flash the castings and then, after rinsing thoroughly, transfer the castings to an alkaline zinc bath. It would seem logical to conduct the entire zinc plating operation in acid solutions, but, in the first place, it is claimed that acid zinc deposits of lighter thicknesses are not as protective as those produced in alkaline solutions as referred to in the Bureau of Standard Research Paper No. 867, and secondly, the throwing power of acid zinc baths is astoundingly poor. It is this latter characteristic that makes the use of an acid zinc flash useless on all articles except those of relatively simple shapes. Again there is the disadvantage of multiple plating operations.

Many conditioning dips have been proposed for treating castings to be alkaline zinc plated, the most recent consisting of a thirty-minute dip in a hot (nearly boiling) concentrated sodium cyanide solution. This has been tried on admittedly difficult-to-plate castings without success. A prolonged dip in a cyanide solution is objectionable as salts are retained in the pores in the metal which cause "spotting out" later, especially when the parts are used or stored under conditions of high humidity.

We have experimented in our laboratory with an alkaline tin flash in a solution of high alkalinity and low metal concentration. Such a solution has a low cathode efficiency when used at high current densities but has remarkable throwing and covering power. By using this strike excellent results were obtained. There is some question as to the electrochemical effect on the tin undercoating in respect to the corrosion protective qualities. This investigation was not completed because of the present strategic position of tin.

Malleable and grey iron castings should not be over-cleaned or overpickled. If the castings have been machined and as a consequence are covered with oil, they should be degreased. To remove sand and slag, sandblasting is preferred, although shotblasting is effective. The articles should be electro-cleaned in an alkaline solution. Ordinarily the work is made cathodic, but where racks are used, and they are returned through the plating cycle without being stripped, reverse current cleaning is recommended.

The surface of the castings should be prepared so that prolonged pickling is not required. We have found that some types of castings can be plated when an acid dip is not used. Even a slight acid dip on these castings leads to noticeably poor coverage. On other castings, a moderate acid dip is not objectionable. Still other castings require an acid dip for satisfactory coverage.

There are cases where sand or shotblasting equipment is not available; in these cases a sulphuric acid-hydrofluoric acid dip is recommended. This combination removes oxides and sand, although the surface is in a less acceptable condition to receive a zinc deposit. On mechanically-pre-cleaned castings a 20% by volume hydrochloric acid dip for about 3-10 seconds is recommended. If sulphuric acid must be used, a 5-8% solution and a dipping time of 5-15 seconds is usually sufficient. After acid pickling the work is removed, given a quick sodium cyanide dip (4 oz./gal.) and after rinsing again, is transferred to the zinc plating solution. Prolonged soaking in the cyanide should be avoided as it will lead to spotting-out on some castings.

Modifying the precleaning, alkaline cleaning, and pickling procedures as outlined above have little effect upon the ability of many castings to accept zinc. In our experi-



mental work we have approached the problem from two directions and have been successful in both cases. First, we attempted to alter the plating solution so that the electrochemical conditions at the cathode would be changed, or in other words, the overvoltage at the cathode face would be raised. Secondly, we attempted to treat the castings so that foreign matter on the surface responsible for the preferential discharge of hydrogen in the zinc bath, would be completely removed.

Considering the first method, it was found early in our work that sodium carbonate, a constituent normally present in alkaline zinc solutions, had an unmistakably beneficial effect. Castings that would accept no zinc whatsoever could be completely covered if a certain quantity of sodium carbonate were present. The minimum concentration recommended is 5 oz./gal. Sodium sulphate in concentration of over 10 oz./gal. also produced excellent results, although there is danger of adding this salt where the use of calcium sulphate carbonate remover is contemplated.

While using these salts permitted the plating of many castings otherwise unplatable, there were many castings gathered from various sources that could not be covered. The addition of colloids such as glue, natural gums and resins, and also modern brightening agents produced further improvement in the controlled-carbonate solution but satisfactory results on all castings were not obtained until it was found that a high current density strike in a bright, carbonate-containing solution changed the cathode potential sufficiently to permit uniform and complete zinc deposition.

The strike in this case had the following composition:

Zinc cyanide .....	8 oz./gal.
Sodium cyanide .....	5 oz./gal.
Sodium hydroxide .....	11 oz./gal.
Sodium carbonate .....	5 oz./gal.
Ketonic Brightener .....	66 oz./gal.

The striking time recommended is 1—2 minutes and the current density, 125 amp./sq. ft. This current density can be obtained at a tank voltage of 8—9 volts. After striking, the work is transferred to the regular plating solution of identical composition where plating proceeds at the normal current density. By using this system, all grey and malleable castings collected from various sources have been satisfactorily plated. It is probable that bright zinc solutions other than the one mentioned above will yield similar results. Ordinary zinc solutions without brightening or addition agents used as a strike are not effective in all cases and furthermore, do not throw in recesses completely.

The second method of plating grey and malleable castings involves treatment of the castings before going into the plating cycle to remove graphite, ferrosilicon and other constituents normally present.

It was suggested to us by a well-known metallurgist that a molten caustic soda treatment would produce a surface receptive to zinc. When tried, the results were far from perfect, although improvement was observed. By incorporating about 10% of another alkaline salt with the fused caustic soda, all types of castings plated perfectly.

The procedure involves a  $\frac{1}{2}$ —3 minute immersion in the

molten salt bath at a temperature of 725° F, the melt being heated by gas in a cast-iron pot. The castings are then rinsed in warm water and given a short anodic electrocleaning. After rinsing, the work is dipped in a 20—30% by volume hydrochloric acid, rinsed, cyanide dipped and then transferred to the zinc plating solution. Any well-balanced zinc bath can be used for plating but bright zinc solutions throw into recesses deeper than ordinary dull plating solutions.

The third method of plating castings was developed within the past few weeks. It is an electrolytic pickling process using a simple neutral salt solution. The castings are electrocleaned as usual, rinsed, acid dipped and then anodically electropickled for  $\frac{1}{2}$ —4 minutes at a current density of 25—75 amp./sq. ft. They are rinsed, dipped in a sodium cyanide solution and then transferred to an ordinary cyanide zinc solution or a bright zinc solution. No heating is required and the solution can be held in an unlined wood tank.

Unlike acid electropickling processes, smut is not formed on the surface of the work being treated. The surface is slightly etched, however, and the lustre of the deposited zinc is not as high as when using the carbonate-containing, high current density strike. Investigation of the solution is continuing.

In plating castings it is not generally recognized that the actual surface area of a casting may be larger than the apparent area as measured with a ruler or other device. In plating castings it is advisable to use as much as 50—75% more current on the work than would be indicated by usual surface measurements. This is borne out by the fact that thickness measurements of deposits made on castings are appreciably lower under a given set of plating conditions than when polished or cold rolled metals are plated. We have checked this further by plating castings at the correctly calculated current density (from physical measurements) in a solution having a very narrow bright plating range, namely, 10—15 amp./sq. ft. It was found that the deposits were only semi-bright. Raising the current to around 25 amp./sq. ft. produced bright deposits. Plating at this current density on cold rolled steel surfaces would have resulted in burned deposits. Considering the increased area of the castings caused by surface irregularities, the actual current density may have been in this case only around 15 amp./sq. ft.

With predominant interest at present in cyanide zinc solutions, it is not realized by many platers that advances have been made in depositing zinc from other types of solutions.

For almost two years, a new type of acid bath developed in our organization, has been used by one of the steel companies for plating steel strip on a commercial scale. This is the first public announcement of the method which we term the "Rapid Zinc Process." The deposits produced are ductile and even when applied to steel in heavy thicknesses, are capable of withstanding severe deforming without rupture. This feature is particularly important in the manufacture of ridged roofing in plating wire.

The solution is simple in composition; it contains only two ordinary chemicals—zinc chloride and zinc acetate. No addition agents are required. A simple method of analysis is provided for control.

Depending upon the particular application, ductile de-



posits of zinc, free from trees and coarsely crystalline growths can be obtained at current densities of 40 to 1000 amp./sq. ft. For depositing zinc on steel shapes of simple design, 40 to 100 amp./sq. ft. can be used. For steel sheets 3 to 6 feet wide, 400 to 500 amp./sq. ft. is possible. For electrogalvanizing wire 1000 amp./sq. ft. is well within the limits of the solution.

At the recommended anode-cathode spacing, the voltage required for low current density plating (40—100 amp./sq. ft.) is from 3 to 5. For plating wide steel sheets, 5—8 volts is required. For electrogalvanizing wire at 1000 amp./sq. ft. 15 volts are required with an anode-cathode distance of  $\frac{1}{2}$  inch.

The optimum operating temperature of the "Rapid Zinc Bath" is 120° F. The temperature is not critical and may be varied between 100° and 130° F.

The operating pH is 3.6 electrometric or 4.1 colorimetric. When the bath is operated with zinc-aluminum alloy anodes, there is no chemical attack when the solution is standing idle.

This feature, in combination with practically 100% anode and cathode efficiencies, and also the inherent stability of the chemical constituents of the bath, results in an almost constant solution pH. The ordinary acid zinc sulphate bath is far from stable in this respect.

In regard to equipment, tanks should be constructed of rubber-lined steel, ceramic ware, or tempered glass. Other linings that are made of non-strategic materials are now being investigated. The solution can be heated with Pyrex, Duriron or Karbate heat exchangers. Ceramic or Karbate coils can also be used. A filtration unit is required for initial filtrations in preparing the bath. Because of clean corrosion of the alloy anodes, filtration of the operating solution need not be frequent unless the equipment is situated where a large amount of dust and dirt falls into the solution. Stainless steel or rubber covered filters are recommended.

In the Rapid Zinc Process, particular attention should be given to turbulence or flow of solution. The rate of solution flow depends upon the particular application. A directed discharge from a centrifugal pump or a submerged propeller in a casing which directs the flow, such as the Speed-O-Plate Agitator, produces satisfactory results.

Present conditions have retarded the expansion in use of this process although its use is at the moment being studied in connection with the application of heavy deposits on parts for ordnance. Widespread post-war use of the process is predicted.

Another process for zinc plating which is in pilot-plant use, but which has been little publicized is the Hubbell-Weisberg Process. The advantage of this process lies in its ability to use cheap sources of zinc such as galvanizers' skimmings, brass foundry fume, organic reduction residues or ore, by leaching in a solution of ammonia or ammonium chloride. Insoluble graphite anodes are used in the plating tank. Plating reduces the zinc content of the plating solution which is then returned to the leaching plant where the zinc removed by plating is replaced.

The process produces zinc coated wire or strip which is equal to that produced by other zinc plating methods. Steel handling, pickling, and cleaning are the same as for other processes. The plating tank has been specially designed to take advantage of the fact that anodes seldom have to be changed and to provide covers which prevent the escape

of ammonia fumes and at the same time permit easy rethreading of wires or strips.

The process works at high current densities and this, combined with the high conductivity of the solution and the careful design of the electric equipment from generator to contractor, makes the process economical of electric power.

The real advantage of the process lies in the low cost of the zinc going to the plating operation. This advantage increases as the amount of zinc used increases because a special plant has to be provided to put the zinc in skimmings or other products into solution and the operating costs of this plant must be added to the purchase price of zinc in the plating tank. Depending upon the cost of zinc materials available, the process will not be economical unless from about  $1\frac{1}{2}$  to  $2\frac{1}{2}$  tons of zinc are required per 24 hours. As the daily consumption of zinc increases above this minimum, the savings become increasingly impressive. Obviously, this process will not appeal to the average plater but is of tremendous interest to large scale users of zinc such as steel mills.

In conclusion, I would like to call your attention to the fact that surface treatments on electrodeposited zinc are assuming increasing importance. Dr. Meyer has discussed black finishes; government specifications call for passivating dips before painting or lacquering; Bonderizing of zinc for paint adhesion has long been practiced. Recently, the Cronak finish, as developed by the New Jersey Zinc Company, originally for the treatment of die castings, has been adopted for the treatment of plated zinc surfaces. It is being used on cartridge cases, signal corps equipment, fuse parts and many other articles entering into our war effort.

It is characteristic of zinc surfaces to corrode with the formation of bulky white corrosion products when in contact with stagnant moisture or under conditions of slow drying. Treatment for a few seconds in the Cronak solution, which is sodium dichromate acidified with sulphuric acid, produces a basic zinc chromate film, which has remarkable inhibiting power. The color of the film varies from an iridescent yellowish-bronze in short treatment to a more uniform brass color upon long treatment. I have seen panels exposed to the atmosphere for over one year without any surface corrosion visible. Untreated panels under identical conditions were covered with bulky white corrosion products. The New Jersey Zinc Company is issuing licenses for the use of this process and will gladly give further technical information to interested manufacturers.

Zinc plating today is not becoming important—it is already important. With the experience accumulated during this trying period, we can predict now that, after the war, zinc plating will find ever-increasing applications and that the quality, protective value and ease of application will reach heights unknown only a few years ago.

#### Correction

Mr. W. Paul Sykes, who wrote the article entitled "Hanging and Racking Airplane Parts for Processing" which appeared in the March issue of *Metal Finishing*, is Foreman of the Processing and Heat Treating Department of Vega Aircraft Company, Burbank, California, and not a process engineer of Lockheed Aircraft Company as stated in his by-line.

# THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING's Washington Correspondent



## Aluminum Coloring Discussed

The April meeting of the Baltimore-Washington Branch of the American Electroplaters' Society, which was held in Washington on April 3, 1943, had as its speaker L. G. Tubbs, Vice President of the Baltimore-Washington Branch and Chief Chemist of the Mutual Chemical Co., who gave an informal, round-table talk on "Dyed Anodic Coatings on Aluminum," which he illustrated with a display of many samples. Mr. Tubbs, an authority on this sort of metal finishing, is of the opinion that the dyed anodic coating process is not only a practical signal and identification system, but also a type of decorative finish which will take on increasing importance in the post-war period. In his talk he dealt with some of the phases of coating aluminum with dyes. First, he emphasized the importance of the preparatory condition of the surface of aluminum to prevent pits, scratches, finger prints, and stains from showing up on the finished article. Second, he made some brief remarks on the effect of different acids and alloys on the coloring of aluminum. Third, the thickness of the color film, he said, was determined both by temperature and the length of time the article is left in the bath. Some dyes, such as green, he declared, are more sensitive to temperature than others. Fourth, he said that wax is used to finish colored aluminum articles because it brightens them up and makes them easier to handle.

## Corrosion Retarded by Spraying

To retard the corrosion of iron and steel parts subject to intense furnace high temperatures and gases, the parts are now being coated with aluminum, nickel chrome steel or straight nickel chrome. Aluminum coating is said to be ideal where the part is subject to a temperature below 1,800° F. In this process, after the surface has been prepared, an 0.010" aluminum coating is deposited on the part with a spray gun. This is followed by three coats of sodium silicate. When the third coat is dry the part is then placed for thirty minutes in a furnace with a temperature of 1,800° F. During this heat treatment a thin coat of aluminum oxide forms on the surface of the part. Under this lies a layer of pure aluminum against the base metal. Should the iron and steel parts be subjected to temperatures in excess of 1,800° F., then nickel-chrome alloy is the preferable coating, the experts say. In this process the surface is not heated. After spraying the parts with nickel-chrome alloy, the surfaces are coated with ceramic paint.

## New Forms in Two Colors

Those members of the metal finishing industry who normally applied for priority assistance on Form PD-1A must now use the revised form. This new form is printed in two colors. The yellow colored form is used in applying for preference ratings on items which are to be exported without further processing, and the white form is used for all other ratings.

## Class B Products New Symbols

The WPB on April 14, 1943 announced an entirely new set of symbols for Class B products such as spraying equipment, anodizing equipment, electroplating equipment, electroplaters', galvanizers' and other metal coat-ers' services, paint and varnish making machinery, metal heat treating equipment, polishing and buffing tools, and electric motors and generators. The idea of applying new symbols to Class B products is to provide the WPB with a method of determining at mill levels, the uses to which controlled materials are being put.

## Metal Spraying Quicker

War-time conditions have made it clear that metal spraying of worn parts is a quicker way of getting a machine back into service than getting an order through the purchasing department for a new part. One of the greatest advances in this process of servicing worn parts is the use of liquified petroleum gases as a fuel in fusing the metal. Of these gases propane is said to be the cheapest and the most convenient. Propane is easier to control, and the deposit of metal with propane is denser than when other fuels are used except hydrogen. The oxygen consumption in propane is higher than with acetylene, but the total cost of the propane method is said to be about 30 per cent less.

## Zinc Spraying

Structural materials which are exposed to extreme corrosion, are now being sprayed with zinc to preserve them. The first cost of this method of coating is more expensive than paint, but in the long run it is said to be cheaper and better.

## Spraying for Reclamation

In Diesel piston reclamation work, bronze, iron, 25 carbon steel or zinc spraying is used, especially zinc. Bronze, 13 to 16 per cent chrome steel, and stainless steel spraying are used to restore the original efficiency, and to prevent further cavitation of centrifugal pumps.

## Copper Plating Restricted

Copper Chemicals General Preference Order M-227, as amended April 6, 1943, provides that "the use of copper chemicals in plating is prohibited in every case where the use of copper products or copper base alloy products in plating is prohibited by paragraph (d) (2) of Conservation Order M-9-c, as amended from time to time."

**CMP Interpretation Issued as Warning** To halt the practice of some manufacturers who are placing more than one order for the aluminum, copper, and other critical materials allotted to them under the Controlled Materials Plan, the WPB issued on March 22, 1943, Interpretation No. 2 of CMP Regulation No. 1. This interpretation points out that the duplication of orders for allotted materials is a violation of the law and subjects such offenders to severe penalties under the Federal criminal code.

**Galvanized and Enameled Steel Prices** The OPA issued on April 9, 1943 Amendment No. 14 to Revised Price Schedule 49. This 70-page amendment, which is set in agate type, is jammed full of tables which give the specific dollars and cents prices of practically all prime quality iron and steel products sold by heavy line steel warehouses located in the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Virginia, and those located in the eastern portions of the states of New York, Pennsylvania, Maryland, and North Carolina. This amendment gives the maximum prices for certain prime iron and steel products such as *galvanized iron sheets, galvanized steel sheets, galvanized sheets, long terme plates, and enameling sheets*. It gives the methods of computing (1) the zone destination price, (2) the zone shipping point price, and (3) governing basing point price. It also lays down the rules regarding discounts and privileges, and restrictions and extras.

**Metal Finishing Essential Industry** Enameling, galvanizing, japaning, lacquering, painting, and plating of metal products were considered essential activities in the April 17, 1943 revised listing of *essential industries* issued by the War Manpower Commission. This means that metal finishing employers may ask for permission to defer the drafting of an essential employee. On the other hand, all employees in the metal finishing industry are frozen to their positions by the new directive issued by the WMP.

**Metal Plating Prohibited** The use of aluminum, cadmium, stainless or chrome steel, *tin, zinc, metallic plating or metallic finishes* is prohibited in the manufacture of hand trucks, dollies, trailers, racks, non-self propelled lift trucks and platform types of portable elevators, and any related material handling equipment by General Limitation Order L-111, as amended April 13, 1943. There are a few exceptions to this rule. First, alloy steel may be used in bearings, and in lift trucks, and zinc may be used for galvanizing when necessary to meet the requirements of the Department of Agriculture's Bureau of Animal Industry.

**Metal Finishing Second-Hand Equipment Prices** The OPA provided two methods of determining the ceiling on used machinery and second-hand parts in the issuance on April 6, 1943 of Amendment No. 76 to Maximum Price Regulation No. 136, as amended. One method provides that the maximum price for rebuilt or guaranteed, second-hand machines or parts shall not be in excess of 85 per cent of the maximum price for the nearest new equivalent machine f.o.b. factory, and for a second-hand machine or part which is not rebuilt or guaranteed, the price shall not exceed 80 per cent of the maximum price for the nearest new equivalent f.o.b. factory. In the second method the price is computed on a depreciation basis. For example, the nearest new equivalent is used as the base price. From this price the seller is permitted to deduct, according to the scale of depreciation for different machines listed in Appendix D of the Amendment, the accumulated depreciation between the date of original purchase of the machine as a new device and the date of sale as a second-hand machine. The table of depreciation allows 7½ per cent per annum on ceramics machinery and chemical process machinery; 5 per cent on electroplating and hot dip metal coating equipment, and 5 per cent on painting and varnish making equipment.

**Order P-120 Revoked** To prevent confusion with CMP Regulation No. 5 which provides a method for the acquisition of maintenance, repair, and operating supplies of *electroplaters, aluminum and manganese producers, and the manufacturers of many other products*, the WPB on April 1, 1943 revoked Order P-120 issued on October 6, 1942.

**Order P-134 Revoked** To prevent confusion with CMP Regulation No. 5, which includes the repair and maintenance of *electroplating equipment and metal finishing operating supplies*, Order P-134 was revoked on April 15, 1943.

**Palm Oil Order** The Secretary of Agriculture issued Food Distribution Order No. 38 on March 22, 1943 which replaces WPB Order M-59 on palm oil. The control over the use of palm oil, which has been limited since April 1, 1942, to the manufacture of tinplate, terme plate, steel sheets, steel strip, and black plate, and to processes yielding the required percentages of glycerine, was transferred to the Food Distribution Administration with this order. FD Order 38 continues the restrictions of Order M-59 on the delivery, processing, and use of palm oil with one exception. It provides for the exemption of any person using less than 2,000 pounds of palm oil per quarter.

**Shipping Container Price Regulation** To assure those who are now having difficulty in getting the needed supplies of *tallow and greases* which are required in the manufacture of batteries, chemicals, and metal polishes, the OPA issued on April 6, 1943 Amendment No. 29 to Revised Price Schedule No. 53 to permit dealers in these materials to charge a premium of ¾ cent a pound when shipped in returnable drums, barrels or tierces in carload lots. A differential of ⅞ cent per pound must be added if those containers are shipped in less than carload lots. The differential is 1 cent a pound on carload lots and 1½ cents a pound on less than carload lots if the materials are shipped in non-returnable containers.

**Silver Prices Increased** The OPA announced on March 23, 1943 that manufacturers, wholesalers and retailers of *silverware, jewelry, ecclesiastical ware, jewelry findings, insignia, fountain pens, mechanical pencils, watch cases, mirrors, tinsel, zippers, and eye glass and spectacle frames and mountings* are now permitted to increase their maximum prices by 36 cents for each troy ounce of fine domestic silver used in those articles.

**Toxic Oxides Pamphlet** To conserve war-time manpower the Bureau of Mines chemists of the Department of Interior have assembled information on a method of detecting the toxic oxides of nitrogen that imperil the health of persons working in contaminated atmospheres of industrial plants in which these gases are produced, *such as bright dipping departments*. These findings were compiled in an illustrated, 24-page pamphlet called "Determination of the Oxides of Nitrogen by the Phenoldisulfonic Acid Method" by Robert L. Beatty, L. B. Berger, and H. H. Schrenk. A copy of this report may be obtained free by any reader of *Metal Finishing* by writing to the Bureau of Mines, Department of Interior, Washington, D. C.

**Used Motor Unit Established** The General Industrial Equipment Division of the WPB has set up a Used Motor Unit for the purpose of locating and bringing into use idle motors and generators because the failure to do so increases the demand for new equipment and wastes man power and plant facilities which are urgently needed for war production purposes. The chief function of this newly created unit will be that of acting as a clearing house for owners and prospective buyers of idle motors and generators.



## DIRECTORY OF WPB CHEMICALS DIVISION

To help *Metal Finishing* readers, a directory of the Commodity Section and Unit Chiefs and the Commodity Designees of the Chemicals Division of the War Production Board, as of April 15, 1943, is here presented. This directory should save considerable time in contacting with, or directing correspondence to, the proper administrator in Washington.

Commodity Section and Unit	Administrative Head
Alcohol and Solvents Section	John Boyer
1. Industrial Alcohol Unit	R. H. Grimm
2. Solvents Unit	W. Mueller
Aromatics and Intermediate Section	Fletcher Twombly
3. Cellulose Unit	E. L. Pearson
4. Coal Tar Products Unit	E. Casey
5. Intermediates	H. M. Harker
6. Plasticizers and Glycols	R. G. Ruark
Inorganic Section	J. W. Wizeman
7. Acids and Salts Unit	P. B. Blakemore
8. Chlorine-Alkali Unit	J. C. Leppart
9. Compressed Gases Unit	R. H. Rowan
10. Nitrogen Unit	H. H. Meyers
11. Insecticides & Fungicides Unit	W. H. Meyer
Plastics & Synthetic Rubber Section	F. H. Carman
12. Adhesives Unit	Nils Anderson
13. Thermoplastics Unit	James R. Turnbull
14. Thermosetting Unit	Clinton Rector
15. Synthetic Rubber Plant Requirements Unit	G. L. Roberts
Protective Coatings and Materials Section	T. Craig
16. Associated Materials Unit	C. R. Caryl
17. Coated Fabrics Unit	P. F. Corbin
18. Paint, Varnish & Lacquer Unit	B. M. Belcher
19. Pigments and Color Unit	T. J. Starkie

Commodity	Unit	Designee
Acetone	2.	H. Mueller
Acids:		
Acetic	2.	H. Mueller
Boric	8.	S. W. Varn
Chromic	7.	W. H. Healey
Hydrochloric	7.	R. W. Field
Hydrofluoric	11.	W. V. Fox
Nitric	10.	W. C. Cope
Oleic	7.	P. B. Blakemore
Phosphoric	7.	W. R. Corey
Sulfuric	7.	W. V. Fox
Alcohol:		
Amyl	2.	H. Mueller
Butyl	2.	H. Mueller
Diacetone	1.	H. Mueller
Methyl	1.	H. Mueller
Aldol	2.	H. Mueller
Alkyd resins	18.	D. M. Gray
Aluminum Powder	19.	C. Luke
Aluminum:		
Acetate	7.	C. Peirson
Ammonium Sulfate	7.	C. Peirson
Chloride, anhydrous	8.	R. F. Herron
Chloride, liquid and crystal	7.	C. Peirson
Hydroxide	7.	C. Peirson
Naphthenate	16.	H. W. Howard
Potassium Sulfate	7.	C. Peirson
Sodium Sulfate	7.	C. Peirson
Stearate	19.	T. J. Starkie
Sulfate	7.	C. Peirson
Ammonia, anhydrous	10.	R. F. Boehm
Ammonia, Aqua	10.	R. F. Boehm
Ammonium:		
Aluminum sulfate	7.	C. Peirson
Bichromate	7.	W. H. Healey

Commodity	Unit	Designee
Chloride	10.	R. O. Austin
Molybdate	7.	W. H. Healey
Perchlorate	7.	V. Boutin
Persulfate	7.	V. Boutin
Phosphate	7.	W. R. Corey
Sulfate	10.	H. L. Taylor
Sulfide	7.	S. Wallach
Thiocyanate	10.	R. O. Austin
Thiosulfate	7.	S. Wallach
Amyl Acetate	2.	H. Mueller
Amyl ether	2.	H. Mueller
Antimony Trichloride	7.	C. Peirson
Arabic Gum	16.	F. Gunn, Jr.
Arsenic	11.	W. H. Meyer
Baking Coatings	18.	C. M. Rice
Baking Varnishes	18.	C. M. Rice
Barium:		
Base Inert	19.	T. J. Starkie
Carbonate	7.	V. Boutin
Chloride	7.	V. Boutin
Chromate	19.	T. J. Starkie
Hydroxide	7.	V. Boutin
Sulfate	19.	T. J. Starkie
Beeswax	16.	W. A. Chaskel
Benzol	4.	P. R. Eisenhuth
Blanc Fixe	19.	T. J. Starkie
Borax	8.	R. L. Reynolds
Butyl acetate	2.	H. Mueller
Butyl aldehyde	2.	H. Mueller
Cadmium Pigments	19.	T. J. Starkie
Cadmium Selenide	19.	T. J. Starkie
Cadmium Sulfide	19.	T. J. Starkie
Calcium:		
Base Inerts	19.	T. J. Starkie
Carbonate	8.	R. F. Herron
Chloride	8.	R. F. Herron
Stearate	19.	T. J. Starkie
Sulfate	19.	T. J. Starkie
Candililla Wax	16.	W. A. Chaskel
Carbon Black	19.	T. J. Starkie
Carbon Decolorizing	5.	G. W. Truxal
Carbon Tetrachloride	8.	H. J. Lucey
Carnauba Wax	16.	W. A. Chaskel
Castor Oil Phthalate	6.	W. M. Hackman
Caustic Potash	8.	S. W. Varn
Caustic Soda	8.	J. E. Russell
Celite	19.	T. J. Starkie
Cellulose Nitrate	18.	T. Craig
Cellulose Finishes	18.	D. M. Gray
Chromic Alum	7.	W. H. Healey
Chrome Pigments	19.	T. J. Starkie
Chromic Acid	7.	W. H. Healey
Chromium Chemicals	7.	W. H. Healey
Clay	19.	T. J. Starkie
Cobalt Naphthenate	16.	H. W. Howard
Cobalt Oleate	16.	H. W. Howard
Cobalt Resinate	16.	H. W. Howard
Cobalt Pigments	19.	T. J. Starkie
Colors: Inorganic	19.	T. J. Starkie
Colors: Organic & Chemical	19.	T. J. Starkie
Copper:		
Carbonate	11.	M. Goldberg
Cyanide	11.	M. Goldberg
Sulfate	11.	M. Goldberg
Diacetone Alcohol	2.	H. Mueller
Dibutyl Phthalate	6.	W. M. Hackman
Diethylene Glycol	6.	J. P. Conway
Driers, all kinds	16.	H. W. Howard
Ethanol	1.	R. H. Grimm
Ether, Ethyl	2.	H. Mueller
Ether, Isopropyl	2.	H. Mueller
Ethyl Acetate	2.	H. Mueller
Ethyl Alcohol	1.	R. H. Grimm
Ethylene Glycol	6.	J. P. Conway

Commodity	Unit	Designee	Commodity	Unit	Designee
<b>Ferric:</b>			Paint Removers	18.	B. M. Belcher
Ammonium Citrate	6.	Miss M. E. Reichmann	Paraffin, Chlorinated	8.	H. J. Lucey
Ammonium Sulfate	7.	W. H. Healey	Paraffin Wax	16.	F. Gunn, Jr.
Chloride	8.	P. R. Welch	Pentastol	2.	H. Mueller
Sulfate	7.	R. W. Field	Perchloroethylene	8.	H. J. Lucey
Ferrous Sulfate	7.	R. W. Field	Perchloric Acid	7.	V. Boutin
Formaldehyde	5.	E. W. Biggs	Phenolic Resins for		
Glyptal Resins	18.	C. M. Rice	Coatings	18.	C. M. Rice
Halowax	8.	H. J. Lucey	Pigments and Colors	19.	T. J. Starkie
Hydrochloric Acid	7.	R. W. Field	Potassium:		
Hydrogen Peroxide	7.	V. Boutin	Aluminum Sulfate	7.	C. Peirson
Hydrogenated Castor			Antimonate	7.	C. Peirson
Oil Phthalate	6.	W. M. Hackman	Antimony Tartrate	6.	Miss M. E. Reichmann
Industrial Finishes	18.	C. M. Rice	Bitartrate	6.	Miss M. E. Reichmann
Iron Oxide	19.	T. J. Starkie	Carbonate	8.	S. W. Varn
Isobutyl Alcohol	2.	H. Mueller	Chlorate	7.	V. Boutin
Isobutyl Castor Oil			Cyanide	10.	R. O. Austin
Phthalate	6.	W. M. Hackman	Dichromate	7.	W. H. Healey
<b>Isopropyl:</b>			Nitrate	10.	A. C. Austin
Acetate	2.	H. Mueller	Permanganate	7.	V. Boutin
Alcohol	2.	F. E. Bennett	Phosphate	7.	W. R. Corey
Butyrate	2.	H. Mueller	Resins, Natural	16.	Mrs. K. A. Dillard
Ether	2.	H. Mueller	Resins, Synthetic:		
Propionate	2.	H. Mueller	Alkyd	18.	C. M. Rice
Lacquers	18.	B. M. Belcher	Para Phenyl Phenyl	18.	C. M. Rice
<b>Lead:</b>			Phenolic Coatings	18.	C. M. Rice
Acetate	7.	C. Peirson	Rosin	16.	D. L. Lewis
Carbonate	19.	T. J. Starkie	Silver:		
Chromate	19.	T. J. Starkie	Cyanide	7.	C. Peirson
Dioxide	7.	C. Peirson	Nitrate	7.	C. Peirson
Naphthenate	16.	H. W. Howard	Shellac	16.	Mrs. K. A. Dillard
Nitrate	7.	C. Peirson	Sodium:		
Oxide	19.	T. J. Starkie	Acetate	2.	H. Mueller
Peroxide	7.	C. Peirson	Aluminate	7.	C. Peirson
Sulfate	19.	T. J. Starkie	Aluminum Sulfate	7.	C. Peirson
White, in oil	18.	A. C. Goetz	Bicarbonate	8.	W. R. Corey
Lithopone	19.	T. J. Starkie	Bisulphate	7.	R. W. Field
<b>Magnesium:</b>			Carbonate	8.	J. E. Russell
Carbonate	7.	C. Peirson	Chlorate	7.	V. Boutin
Chloride	7.	C. Peirson	Cyanide	10.	R. O. Austin
Oxide	7.	C. Peirson	Dichromate	7.	W. H. Healey
Stearate	19.	T. J. Starkie	Ferrocyanide	10.	R. O. Austin
Maleic Alkyd Resins	18.	C. M. Rice	Nitrate	10.	W. Lehmann
<b>Manganese:</b>			Phosphate	7.	W. R. Corey
Naphthenate	16.	H. W. Howard	Sulfate	7.	R. W. Field
Oleate	16.	H. W. Howard	Sulfite	7.	R. W. Field
Resinate	16.	H. W. Howard	Spanish Oxide	19.	T. J. Starkie
Marine Finishes	18.	B. M. Belcher	Spirits, Varnishes	18.	C. M. Rice
<b>Mercuric:</b>			Tin Oxide	7.	C. Peirson
Chloride	7.	C. Peirson	Tin Tetrachloride	7.	C. Peirson
Cyanide	7.	C. Peirson	Titanium:		
Nitrate	7.	C. Peirson	Dioxide	19.	T. J. Starkie
Oxide	7.	C. Peirson	Oxide	19.	T. J. Starkie
Sulfide	7.	C. Peirson	Pigments	19.	T. J. Starkie
Metal Powder	19.	C. Luke	Toluene	4.	P. R. Eisenhuth
<b>Metal Treating</b>			Trichlorethylene	8.	H. J. Lucey
Compounds	7.	W. H. Healey	Turpentine	16.	D. L. Lewis
Methanol	2.	H. Mueller	Varnish:		
Methyl Ethyl Ketone	2.	H. Mueller	Structural	18.	B. M. Belcher
Methyl Isobutyl Ketone	2.	H. Mueller	Industrial	18.	C. M. Rice
Methyl Propyl Ketone	2.	H. Mueller	Water Paints	18.	W. Barnard
Nitric Acid	10.	W. C. Cope	Waxes, Natural	16.	W. A. Chaskel
<b>Paints, Varnishes and</b>			Zinc:		
Lacquers:			Acetate	7.	C. Peirson
Cellulose Finishes	18.	B. M. Belcher	Ammonium Chloride	7.	R. O. Austin
Industrial Finishes	18.	C. M. Rice	Chloride	7.	C. Peirson
Pretreated Metals	18.	B. M. Belcher	Chromate	7.	W. H. Healey
Red Lead in Oil	18.	A. C. Goetz	Cyanide	7.	C. Peirson
Structural Finishes	18.	B. M. Belcher	Naphthenate	16.	H. W. Howard
Water Paints	18.	B. M. Belcher	Oleate	16.	H. W. Howard
White Lead in Oil	18.	A. C. Goetz	Oxide	19.	T. J. Starkie
Zinc White in Oil	18.	A. C. Goetz	Resinate	16.	H. W. Howard
Zinc Oxide in Oil	18.	A. C. Goetz	Stearate	19.	T. J. Starkie
Lacquers	18.	B. M. Belcher	Sulfate	7.	C. Peirson

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

## Hard Chromium Solutions

**Question:** In operating a tank at 120-140°F. having a fume suction, in 4-6 or 8 hours of steady plating, we lose quite a bit of solution due to evaporation. We would like to keep a certain level in the tank. What do you suggest doing toward keeping this level and the strength of the solution when having to make up for the evaporation? This was a 53-.53 solution to start. Plating at 130°F., 100 A. S. F. with one inch anode spacing, we are only getting about 0.0007 deposit per hour on one side, this being a grayish color with slight pitting and fuzzing at the edges.—R. O. K.

**Answer:** The drop in the level of your solution is due not only to evaporation of water but also to the spray being carried out by the exhaust. The actual composition of the solution thus lost cannot be told and therefore it cannot be stated what materials should be added to make up for the loss.

The correct procedure is to make up the loss in level by addition of water. Then test the solution for chromic acid and sulfate and make additions to the solution to bring these to the desired values.

For methods of controlling chromium solutions, see the *Plating and Finishing Guidebook*. The gray color and fuzzy edges being obtained may be due to incorrect solution composition.

Loss of solution due to spray being carried out may be reduced by having small pieces of an inert material floating on the solution surface. Polystyrene has been suggested for this purpose, but this material is not available now.

## Sodium Nitrate Critical

**Question:** In the February issue of *Metal Finishing*, we have read your interesting article on "Black Oxidizing for Tin Bottle Caps". Your article also gave a formula for compounding the material used as the black oxidizing agent.

May we inquire if the materials listed in your formula are obtainable without government priority or would it be necessary to apply for such priority from the government. If so, could you tell us through what agency we should apply?

Also, we should like to know if the ingredients of the formula would be dangerous to handle or of an explosive nature.—N. P. S. R. Co.

**Answer:** The sodium nitrate mentioned in the formula is on the critical list of chemicals and no large amounts can be obtained without government priority. We doubt very much whether the government will give you a priority for finishing bottle caps. However, if the amounts are not excessive, you will probably be able to obtain them without priority.

We would suggest that you communicate with the War Production Board which will inform you as to the amounts you will be able to purchase without priority.

Caustic soda in concentration and at the temperature employed in this bath is very dangerous if allowed to come in contact with the skin. Fumes arise during operation and must be vented.

Sodium nitrate is considered an ingredient of explosives and as such, a Federal Explosives Licence is required in order to obtain shipments. This may be obtained at your County Clerk's office.

## Insulator to Resist Chromic Acid

**Question:** We are installing a chromic acid anodizing plant and the anodizing tank is made for use with a separate heat exchanger which pumps the chromic acid from the tank into the heat exchanger and then returns it at the desired temperature.

Our problem is to find an electrical insulating connector to be used on the supply and discharge pipe line between the tank and heat exchanger. A rubber connector would be satisfactory except that it would not resist the attack of chromic acid.

This connector must be used to insulate the electrical currents from grounding into the tank. If you will advise what material can be used, it will be much appreciated.—B. M. Co.

**Answer:** We suggest that you use a synthetic connector which will resist oxidizing agents including chromic acid. If you communicate with companies manufacturing plastics and synthetic rubber materials, they will probably be able to recommend specific materials for your purpose. Incidentally, since the chromic acid solution will not cause corrosion of iron equipment even though in electrical contact, we see no reason why you require an electrical insulator on the line to the heat exchanger.

## Testing Specifications

**Question:** This branch contemplates the preparation of a specification covering the testing of zinc, cadmium, copper and lead plating of materials entering into the construction of communications equipment.

In view of the editorial on page 577 of the November, 1942, issue of *Metal Finishing*, we would appreciate your advising us where up-to-date specifications covering the testing of the above-mentioned metallic coatings could be obtained.—J. G. J.

**Answer:** Many specifications for coatings will be found in the standards of the American Society for Testing Materials which can be obtained from the society's office at 260 Broad Street, Philadelphia, Pa. U. S. Army specifications for electroplating may be secured from The Chief, Materiel Division, Air Corps, Wright Field, Dayton, O. Navy specifications are obtainable through the Bureau of Supplies and Accounts, Navy Department, Washington, D. C.

## Formulas for Hard Nickel Plating

**Question:** Will you please give us a formula for hard nickel plating? We have an order to build up gun parts with heavy hard nickel, suitable for wear resistance. The nickel plate has to pass a hardness test.—R. P. P. Co., Ltd.

**Answer:** The following two solutions produce hard nickel deposits:

**No. 1: Moderately Hard Nickel—230-260 Vickers Hardness**

Nickel chloride	40 oz./gal.
Boric acid	4.0 " "
Temperature	140°F.
Current density	20-100 amp./sq. ft.
pH	2.0 electrometric

**No. 2: Hard Nickel—380-500 Vickers Hardness**

Nickel sulfate	24 oz./gal.
Ammonium chloride	3.3 " "
Boric acid	4.0 " "
Temperature	120-140°F.
Current density	25-50 amp./sq. ft.
pH	5.6-5.9 electrometric

In all cases, increasing the temperature and decreasing the pH and the current density will result in softer deposits while the reverse will result in harder deposits.

A set of instructions for heavy and hard nickel plating was issued by The International Nickel Co., 67 Wall St., New York, N. Y., and we suggest that you write them for a copy of this and any other literature on the subject they may have available such as references to articles published in various magazines, etc.



# Patents

## Metal Spraying

*U. S. Pat. 2,314,902.* A. P. Shepard, assignor to Metallizing Engineering Co., Inc., March 30, 1943. In the process of forming, by metal spraying, an adherent coating of metal on a metal surface, the method of preparing such surface which comprises providing a rolling tool having a plurality of circular rows of metal splaying and peening teeth, the teeth of at least some of said rows being out of line with respect to the teeth of other rows, forming a multiple number of closely spaced grooves in such metal surface, repetitiously rolling the grooved metal surface with such tool to cut irregularly spaced teeth.

## Treating Tin Plate

*U. S. Pat. 2,314,818.* W. O. Cook and H. E. Romine, assignors to Carnegie-Illinois Steel Corp., March 23, 1943. The method of treating tinned container stock having thereon a porous oxide film formed at the high temperature incident to the hot tinning of said stock, consisting in removing all of said oxide from and baring a virgin tin surface on said stock, and then subjecting said bared surface to substantially pure air at a temperature relatively low compared to the hot-dip temperature, thereby forming a dense uniform impermeable oxide film throughout said surface rendering said surface substantially immune to the development of yellow stain during normal storage conditions or subsequent baking at temperatures encountered in lithographing and enamelling.

## Pickling Metal Strip

*U. S. Pat. 2,313,422.* R. A. Dimon, assignor to Carnegie-Illinois Steel Corp., Mar. 9, 1943. The method of continuously pickling base metal strip for tin plate and the like, which includes moving the said strip in a substantially vertical loop through an effective pickling solution, said loop being characterized by having the horizontal extent thereof relatively smaller than its vertical extent, imparting to the strip a violent anodic pickling action at the immediate point of its entry into the said pickling solution, continuing the violent anodic pickling action for only a portion of the length of downward vertical travel of the strip through the pickling solution, and discontinuing the violent anodic pickling action at a substantial distance from the end of the length of downward travel of the strip, the remainder of the length of travel of the strip being conducted through the pickling solution while subjected to a pickling action which is entirely chemical, and said anodic and chemical pickling comprising the only pickling to which the strip is subjected in said solution.

## Corrosion Prevention of Ferrous Metals

*U. S. Pat. 2,315,740.* J. M. Schoonmaker, Jr. and F. Stockton, assignors to Standard Steel Spring Co., April 6, 1943. The method of increasing the corrosion resistant characteristics of ferrous base metal articles, which comprises electroplating directly upon the ferrous base a coat of nickel, then electroplating the nickel coating with zinc, and then sealing the pores resulting from electroplating by heat treating the composite electroplated article to a nickel zinc alloying temperature and under temperature-time relations at which there will be no substantial alloying of the nickel with ferrous base, to cause impregnation into the pores left by electroplating while maintaining the nickel unalloyed with the ferrous base, and with the zinc alloyed only with the nickel.

## Abrasive Blasting Apparatus

*U. S. Pat. 2,315,546.* W. A. Rosenberger, assignor to Pangborn Corp., April 6, 1943. In an abrading apparatus, a housing, means on said housing to project a stream of abrasive therein at blasting velocity to define a blasting zone, and means to convey work through said blasting zone comprising a substantially vertical member in said housing, a substantially vertical cylindrical shell of a materially greater diameter than said member encircling and spaced from said member, a bearing between an upper part of said cylindrical shell and said vertical member to rotatably mount said shell, a plurality of radiating arms supported by and extending radially from a section of said shell adjacent the bottom thereof, work supporting means on said arms, and means to effect rotation of said shell to move said work supporting means into and out of said blasting zone.

## Drying Polishing Wheels

*U. S. Pat. 2,315,124.* R. W. Luzius, assignor to Park Chemical Co., March 30, 1943. An apparatus for drying the peripheries of polishing wheels and the like having an axial opening including a rotatable shaft upon which a wheel may be mounted with the shaft passing through the wheel opening, means located in radially spaced relation to the shaft for directing and focusing radiant heat toward the shaft and on the periphery of the wheel to dry the same, and means for rotating the shaft to present all of the periphery of the wheel to the direct action of the radiant heat.

## Pickling Steel Strip

*U. S. Pat. 2,314,369.* T. F. Reed, assignor to United States Steel Corp., March 23, 1943. A continuous steel pickling method comprising producing a continuous flow of pickling solution, heating said solution above atmospheric temperature, continuously passing said steel through said flow in an opposite direction, said steel being heated by said solution, during its passage therethrough until it reaches a zone in said flow where pickling action of said solution is at a maximum rate, sampling said solution in said zone and adjusting the acidity of said flow in accordance with the result of said sampling to maintain a predetermined pickling rate in said zone.

## Portable Drier for Tumbling Barrels

*U. S. Pat. 2,312,936.* D. P. Smith, assignor to The Alvey-Ferguson Co., Mar. 2, 1943. A transportable apparatus for a nozzle delivery of a blast of heated air into a conventional tumbling barrel, comprising: a portable support, a blower and a heater chamber, carried by said support, a conduit interconnecting said blower and said heater chamber, a radial arm pivoted upon said portable support, a hood on the forward end of the radial arm providing a closure for the open end of the barrel, a conduit interconnecting said hood and said heater chamber, a nozzle fixed to said arm within the confines of the hood and a conduit interconnecting said nozzle and said blower, the swing of the arm adapted to alternately bring the hood into or out of operation with said tumbling barrel.

## Corrosion Prevention of Iron and Steel

*U. S. Pat. 2,308,282.* L. H. Howland & W. P. TerHorst, assignors to United States Rubber Co., Jan. 12, 1943. An anti-rust oil for inhibiting the corrosion of metals which comprises a mineral oil and a minor proportion of a dibenzylamine compound selected from the class consisting of dibenzylamine and higher fatty acid salts thereof to inhibit the corrosion of the metal.

### Example:

Slushing oil .....	99.00%
Monobenzylamine .....	0.25%
Dibenzylamine .....	0.75%

## Hot Galvanizing

*U. S. Pat. 2,312,085.* D. Edge & P. H. Wray, Feb. 23, 1943. The combination of a galvanizing pot, means for guiding continuously traveling work through said pot, a continuous furnace having an entrance positioned to receive work leaving said pot prior to its zinc coating spangling, an exit, said work continuously passing through said furnace by way of said entrance and exit, means for causing a draft through said furnace from said exit to said entrance, said furnace having a plurality of radiant heaters and baffles arranged between said heaters to provide a plurality of heating zones in said furnace through which said work successively passes, said baffles extending upwardly from the furnace bottom to adjacent the traveling path of said work, and said means for creating a draft being an arrangement wherein said entrance opens from the furnace inside to a height greater than said exit opens, whereby said baffles forming said heating zones function to prevent sucking of fumes from said pot into said furnace by way of said entrance counter to the flow of said draft.

## Metal Cleaning

*U. S. Pat. 2,307,928.* G. B. Hogaboom, assignor to Hanson-Van Winkle-Munning Co., Jan. 12, 1943. An apparatus for cleaning continuous metal strip electrolytically.

# NEW EQUIPMENT AND SUPPLIES

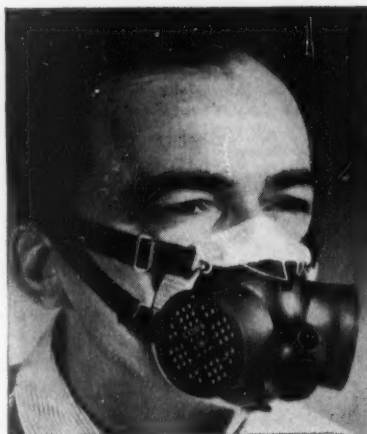
NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

## Degreasers for Room Temperature and Vapor Degreasing

The General Solvents Company, Inc., 926 Exchange St., Rochester, N. Y., is offering "Penotrite," a degreaser for use at room temperature and for vapor degreasing.

The room temperature product is to be used at the bench for inbetween operations, along the production line, or for finishing. No expensive tank equipment is necessary and the product is claimed to be safe as well as economical to use.

Penotrite No. 5 is manufactured exclusively for vapor degreasing and can be used in all types of vapor machines. The manufacturers further claim it to be less toxic to use.



Chemical cartridge respirator.

## Professional Directory

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64 Years in Precious Metals

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Complete services, including solution analyses, process development and deposit tests.  
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Metal Finishing Consultant  
War plating plants designed and streamlined for increased production.  
LA 4-9794 233 W. 26th St.  
New York City

## Analytical Sets

New sets, making it possible to determine the condition of acid pickle or alkaline cleaning solutions have been developed by Kocour Co., Dept. MF, 4724 S. Christiana Avenue, Chicago, Ill.

During use acid pickle solutions build up in salts and decrease in effective acidity. As most efficient and economical operation is obtained when optimum acid quantity is present, control is essential. Alkaline cleaners lose effectiveness by being fouled by the material removed from the work and additions of cleaner become necessary to maintain operating efficiency.

The Kocour Company claims that use of its sets makes it possible to control these solutions with a minimum of effort. A typical set consists of a well made cabinet fitted with hardware to hold the necessary glassware during use and storage. The solutions are in easily handled bottles, well labeled. Readings obtained from the sets involve no calculations. Complete directions and condition of solution sheets are supplied.

## Respirator

A new chemical cartridge respirator—Dupor No. 10—has been developed by H. S. Cover, Dept. MF, South Bend, Ind. An adjustable headband holds it in place and the rubber face piece provides airtight fit without interference with vision or spectacles.

This item is equipped with colored plastic chemical cartridges to make for easy identification of the desired cartridge—white, yellow or black—depending upon the chemical agents in use by the operator. A chart on how to select the right cartridge and exactly what each color is recommended for, is given on the back of the company's literature describing the respirator.

## Cleaner for Tubular Light Fixtures

Temp, a product of the DuBois Co., Cincinnati, O., has a smooth, creamy texture that is readily adapted to difficult cleaning jobs. Temp is said to speedily remove stains and discolorations from fixtures made of tile, enamel, metal and porcelain, without abrasive, scrubbing action.

It is suggested that the material was developed to eliminate the need to use common powder detergents which may be troublesome when employed on overhead fixtures, shades and tubes.

Temp is packed in full and half drums and in cases of 2 lb. cans, and is guaranteed by the manufacturer to be safe on painted surfaces and to contain nothing harmful to the skin. The company offers a generous free trial can on request.

## Lifting Device

A new lifting device for handling coils of strip has been added to the line of material handling equipment manufactured by Never-Slip Safety Clamp Company, 829 Mamaroneck Ave., Mamaroneck, N. Y.

This lifter is readily adjustable for a wide range of coil sizes. It is particularly designed for handling coils in a horizontal position without first raising the coil, as no part of the lifter is underneath the coil.

Brass, copper, aluminum or steel may be handled with this coil lifter said to be entirely non-magnetic and usable on any crane or hoist without the need of special equipment.



Lifter for Coils of Strip.

# BECKMAN pH NOTES

**NO. 1 OF A SERIES**  
Showing how pH affects plating of brass, cadmium, zinc, copper and similar metals.

## How to get better color, fewer rejects in bright brass plating!

### BRASS PLATING

"High Speed" Process

Composition Oz./Gal.

Du Pont "High Speed" Brass Plating Salts 44.0

Du Pont "High Speed" Brass Brightener 5 cc/gal.

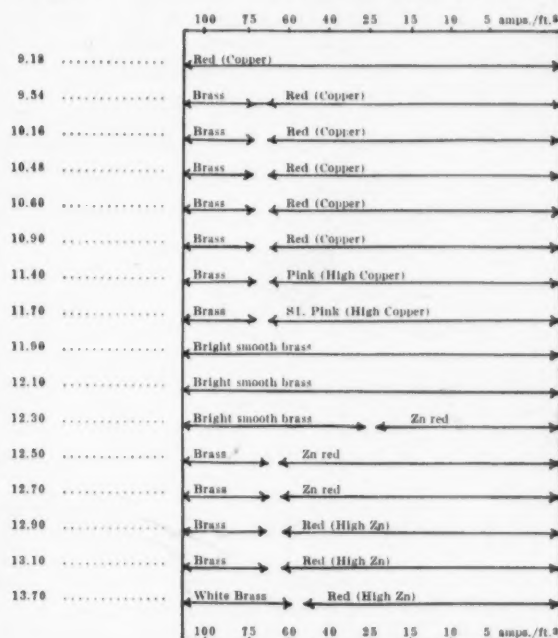
Temperature = 120° F.

Hull Cell Plating Time = 5 min.

Hull Cell Current = 3 amps.

Bath pH

Hull Cell Plating Range



**S**UCCESSFUL operation of brass plating baths depends upon accurate pH control of the bath. In fact, a recent electroplating report states . . . many of the difficulties experienced in brass plating in the past can be attributed to a lack of proper pH control in alkaline cyanide plating baths\*.

Beckman High Alkaline Glass Electrode pH Equipment now makes possible new plating efficiencies in cyanide baths. This equipment—for the first time—permits the accuracy and convenience of glass electrode pH control to be applied to highly alkaline solutions, even in the presence of sodium ions. It is a development of vital importance to all brass, cadmium, copper, zinc and similar cyanide plating operations!

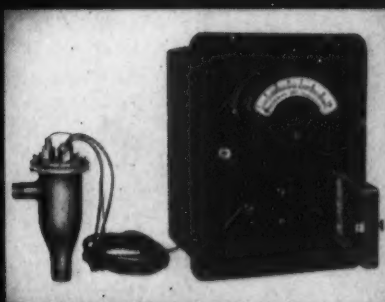
For example, in brass plating the color of the deposited brass is controlled to a large extent by the pH of the solution. Note in the Hull Cell chart at left how, in the "High Speed" brass process, a bright smooth finish is obtained only within a narrow pH range—11.9 to 12.1. A few tenths of a pH unit above or below this range the coating becomes off-color, rejectable!

\*Gray-Proc. Amer. Electroplaters Soc.

Why risk costly "rejects" when you can insure uniformity of your platings with modern Beckman pH Control—the only glass electrode equipment that will accurately measure pH in high-alkaline

cyanide plating baths! Send for helpful literature!

BECKMAN INSTRUMENTS DIVISION, National Technical Laboratories, South Pasadena, California.

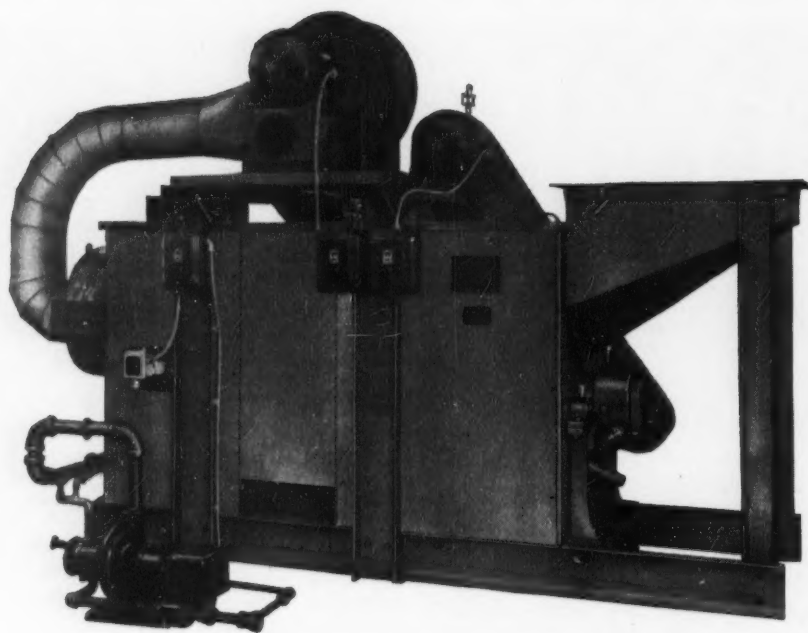


THE BECKMAN AUTOMATIC pH INDICATOR is the most advanced pH instrument available for large-scale plating operations. Automatically indicates, records, and controls. Ask for Bulletin 16!

THE BECKMAN INDUSTRIAL pH METER is ideal for portable plant and field use in the electroplating plant. Highly accurate, simple to operate, ruggedly built. Ask for Bulletin 21!







### Cleaning Equipment

Illustrated above is Model 270, a compact unit for the continuous drying of small parts, manufactured by Colt's Patent Fire Arms Manufacturing Co., Dept. MF, Hartford, Conn.

Smallest of the company's Autosan revolving type machines, this model automatically feeds, dries and discharges parts in one continuous operation.

From the hopper, parts pass into the drying cylinder in controlled volume. As they progress through the machine, they are agitated by the rolling action of the cylinder and the further action of a series of ribs located on the cylinder wall. They

are constantly subjected to a blast of heated air from a duct within the cylinder circulated by a centrifugal type, motor-driven blower, the air being treated by a large steam coil, gas burners or electric heating units.

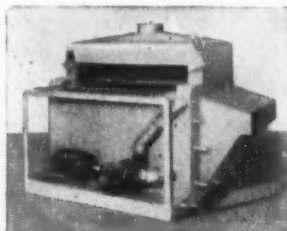
The capacity of this model ranges from 20-45 cubic feet per hour depending on the type of work to be dried and the nature of the heating medium used.

Other models available through the Colt company include both conveyor and revolving models (the latter for drying only) for washing, rinsing and drying; for washing, rinsing, lubricating and drying; or for pickling of work following furnace annealing.

### Single-Stage Washing Machine

N. Ransohoff, Inc., Cincinnati, O., builders of equipment for the surface treatment of metals, have announced a new, single-stage washing machine designed and built to meet the demand for a fast-acting, thorough-cleaning machine to remove oil and chips from work, such as machined shafts of standard or special shapes during inter-process operations. It is adaptable to use for cleaning parts of many descriptions and if desired, can be equipped with perforated baskets for cleaning delicate small parts. It is practical for removing rustproofing oils before assembly from parts which have been shipped from sub-contractors to plants where the complete units are being made.

The outstanding feature in the machine illustrated is the special carriage which consists of V-shaped brackets.



### Soldering Fluid

A new flux, known as Lloyd's No. 6 Soldering Fluid and manufactured by Lloyd S. Johnson Co., Dept. MF., 2241 Indiana Ave., Chicago, Ill., is claimed to break down lead-rich solders into an absolute fluid that will flow into inaccessible places. Said to have high enough capillary action to make solder flow evenly and completely through solder joints, this material is further stated to provide even higher tensile strength than heretofore obtained with 50-50 solders.

Users report that now they can get finest results from 2½% to 6% silver-lead solders, as well as from any of the low temperature solders. It is especially recommended for soldering zinc-coated sheet metal (both galvanized and electroplated), lead coated sheet metal, tin plate,terne plated, brass, copper, steel and all types of sweat fittings. The manufacturers say that the material makes lead burning jobs easy, that it does not crawl or creep, that it has no irritating or choking fumes and that it is so highly concentrated, it can be diluted with 1-2 parts of water for materials that are easy to solder. A free sample of Lloyd's No. 6 Soldering Fluid is being mailed to any company requesting it.

### New Vapor and Solvent Degreasers

The Magnus Chemical Company, Dept. MF., Garwood, N. J., offers a complete line of standard and specially designed vapor and solvent degreasers using the inhibited tetrachlorethylene solvent known as Phill-solv.

These degreasers have distinct advantages over the common trichlorethylene degreasers. They are air cooled, allowing the machine to be portable, thus avoiding installation trouble and the expense of water cooled machines.

Tetrachlorethylene boils at a higher temperature, and has higher density of both liquid and vapor. For these reasons, it is claimed to be more effective in cleaning, and to give lower operating costs. Due to higher density of vapor and lesser toxicity than other chlorinated solvents, it is stated to be safer and more agreeable to work with.

These vapor and solvent degreasers are offered with a known-in-advance operating cost per hour—an important factor—for much vapor degreasing has been engineered and installed where operating costs have subsequently proven to be prohibitive, after it was too late to do anything about it.

Tetrachlorethylene degreasing is new, and engineering data are available to those interested in proof of the manufacturer's statement that it is better, cheaper and safer.

### New Sheet Metal

Aluminized Steel, a new specialty sheet metal, has been developed by The American Rolling Mill Co., Middletown, O., for use in products requiring exceptional resistance to heat and corrosion. An aluminum-coated sheet, with a mild steel base, it is said to combine the surface advantages of aluminum with the strength of steel.

Corrosion resistance of the Aluminized Steel surface is equal to that of an aluminum sheet, according to the manufacturers. When exposed to corrosive attack, a tight oxide film, self-healing and inert, forms on the surface. The metal is passive in most atmospheres and resists "pinholing."

Aluminized Steel withstands temperatures up to 1000 degrees F. without discoloration, the manufacturers say. Even at higher temperatures it resists severe oxidation. It is claimed the aluminum coating will not peel or flake in moderate forming or drawing operations and that paint will hold better on it than on ordinary galvanized sheets; yet for most uses the unpainted surface is satisfactory. After the war it will be available in a finish that can be buffed to a bright luster for good appearance and reflectivity.

Although this product has all the surface qualities of aluminum, a 16 gage sheet of the coated steel uses only five per cent as much of the lighter metal as a solid aluminum sheet of the same thickness.

Present applications of Aluminized Steel include fire walls and air intake filters for aircraft. It is also being considered for cowlings.

# Paint Adhesion WITHOUT ANODIZING



## Phosphatizing With W. O. #1

Try this quick, low-cost method of obtaining adhesion for paints on metals. Turco Phosphatizing with W. O. #1 produces a passive, slightly porous surface which is non-reactive to moisture and makes a thoroughly satisfactory base under all land conditions. It is harmless to metals, rubber or glass. This is the ideal method for treating sheets and large assemblies. It may be applied by immersion, swabbing or spraying and acts as a cleaning agent when used.

No special equipment required for this cheap and speedy process.

Mail the coupon below for complete information.

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*down draft*  
DUST CONTROL  
SYSTEMS



## ANOTHER LARGE PLANER PLANT INCREASES SPEED and EFFICIENCY IN GRINDING OPERATIONS

One of the latest Kirk & Blum installations is that of The G. A. Gray Co., manufacturers of large planers. Here, limited space called for compactness in designing a dust collecting system that would retain all the efficiency so characteristic of Kirk & Blum Systems. Our engineers designed a down-draft system composed of two units, as shown above.

These units, served by American Air Filter Roto Clones, exhaust from three floor, "Down-Draft Stations." System in background is for the express purpose of long planer bed cleaning, and permits men to grind each side of planer simultaneously.

### DUST CAPTURED AT ITS SOURCE

The "Down-Draft Station" in foreground handles all odd size castings, such as columns, housings, rails, etc., and is of sufficient size to permit several men to grind. This arrangement saves time and increases production. The metal dust from grinders is captured at its source and drawn into hoppers under the floor, while cleaned air is discharged into outside atmosphere.

#### SEND FOR ANY OF THESE BOOKLETS:

- "Dust Collecting Systems in Metal Industries"
- "Fan Systems for Various Industries"
- "Blower Systems for Woodworking Plants"
- "Industrial Ovens"
- "Cooling Systems for the Glass Industry"
- "Data on Kirk & Blum Production Facilities"

*Results of this installation are proving the soundness of Kirk & Blum judgment in applying the correct principle to fit the individual job.*

**THE KIRK & BLUM MANUFACTURING CO.**  
AN ORGANIZATION OF ENGINEERS AND MECHANICS  
2859 SPRING GROVE AVE. CINCINNATI, OHIO



Idler stand and pulley.

### Abrasive Belt Idler Stand and Pulley Acts as "Converter"

Present grinding and polishing lathes can be easily adapted to the use of factory-coated abrasive belts at a small investment by adding a Mattison No. J-135 Abrasive Belt Idler Stand and Pulley according to the manufacturer, Mattison Machine Works, Rockford, Ill. The stand is placed at the rear of the lathe, permitting the use of an abrasive belt running over a contact roll or wheel on the lathe, and traveling back around the idler pulley. With this arrangement, grinding is done on the belt, instead of the set-up wheel.

The stand is of substantial construction and adjustable for either right or left hand use. The ball bearing idler pulley is mounted on a yoke, which can be swiveled by handwheel to align pulley with belt. Handwheel adjustment is provided for controlling position of belt on pulleys and a cam arrangement permits easy changing of belts.

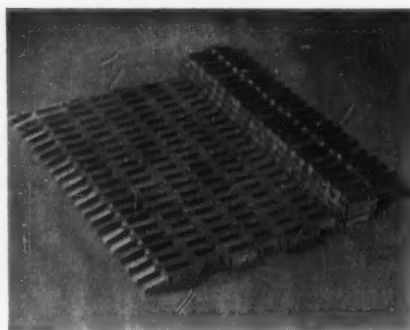
The entire assembly swings on a hinge shaft mounted on the base. Slack in the abrasive belt is automatically taken up by sensitive spring tension, and the spring is adjustable to suit various types of work.

### Paper Protection Against Corrosion

A new, greaseproof, noncorrosive paper has been announced by Sherman Paper Products Corp., Newton Upper Falls, Mass., to protect highly finished metal parts against corrosion. Called V-26, this protective wrapping paper is described as a new development in the packing of war materials, which eliminates multiple wrapping operations at point of use, thereby permitting substantial savings in time. The product, which is reported to meet or surpass all government specifications for

greaseproof, noncorrosive papers, was developed by the company's packaging engineers working in conjunction with the armed services and war industries. It was widely tested in a diversified group of factories, including aircraft, automotive, truck, tank, and other types of ordnance factories.

Multiple wrapping operations are eliminated by combining two protective laminations in one paper. The inner ply provides a greaseproof barrier for the retention of corrosion-preventives used on metal products, while a strong outer ply protects the greaseproof membrane against damage in transit. Both inner and outer laminations are noncorrosive, consisting of neutral kraft, colored red in accordance with government specifications for Grade A noncorrosive papers. Both are creped for greater flexibility in wrapping, with a dead-limp folding quality. The new line is available either with an outer film of wax that provides a self-sealing surface, or uncoated for applications where the self-tack quality is not needed.



Link mat.

### Flexible Wood Link Mat

A recent development, flexible wood link matting, has been announced by American Mat Corp., Dept. MF, 1799 Adams St., Toledo, O. This mat is substantially constructed of wood links. It is light in weight and can be rolled or folded up for easy handling and cleaning. Lying flat, it follows the contour of the floor.

The development of substitute materials in the manufacturing of matting became a vital necessity when rubber and other materials were put on the critical list, if the safety, sanitation and comfort features of matting were to continue available.

Flexible wood link matting makes for safety underfoot, is comfortable to stand on, and affords good drainage. The ends are beveled to reduce the danger of tripping. It comes in natural wood color and is inexpensively priced. The mat is 1" thick, and comes in stock sizes: 18"x32", 24"x38", and 30"x44". It can also be obtained in special sizes of any length and up to 36" in width.

Flexible wood link matting is particularly applicable for use around machinery, in factories, on oily and greasy floors.

To help in conserving present matting through proper care, the American Mat Corporation has set up a special service and advisory department for the duration. Detailed literature is being made available for the asking.

### Compound for Coating Before Drawing

The Magnus Chemical Company, manufacturers of industrial cleaning materials and metal drawing lubricants, have developed a new metal coating compound for coating metal preparatory to drawing.

This material is applied as a dip coating to high or low carbon steel wire, copper coated wire and stainless steel wire after pickling. It was developed to replace the usual lime coat. Called Magnus Metal Coating Compound, this material is also used for coating steel cartridge cases or similar drawn shapes before drawing.

This new coating process is said to be cleaner and more economical than previous procedures and its use to result in easier, more satisfactory drawing with better metal surface and longer die life.

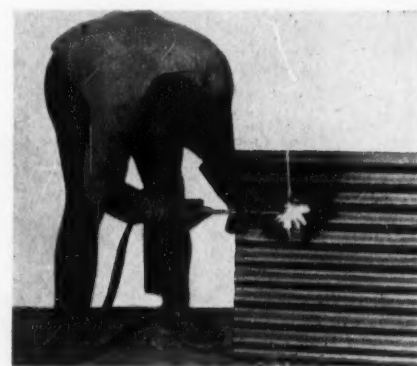
More complete information regarding this new compound can be obtained by writing to the Magnus Chemical Company, Dept. MF., Garwood, N. J.

### Roofing, Siding, Flashing

Plastipitch Protected Products, manufactured by Coated Products Corp., P. O. Box L, Verona, Pa., are particularly adapted for steel roofing, siding and flashing.

Plastipitch Protected roofing, siding and accessories are constituted so that the protective coatings will not flame in event of fire, but will only locally melt away at an extremely high temperature. Plastipitch Protected materials do not require the use of felts or membranes, thus there can be no "fire wicking" action. This characteristic makes Plastipitch Protected materials of special value to chemical plants, foundries, power plants, processing plants, and other types of industrial manufacturing concerns where the danger of fire from within is always present.

In addition to possessing fire resistant characteristics, Plastipitch Protected materials are also acid and alkaline resistant and impervious to all ranges of climate, according to the manufacturer. The materials are factory applied only.



Application of "Plastipitch".



## New Finish for Metal

A new coating for metal products has recently been developed by the laboratories of the Chicago Vitreous Enamel Product Co., Dept. MF., Cicero, Ill. Particularly at this time is this finish welcome news since, being virtually priority-free, it is aiding materially in the conversion of material used in products and in the conservation of critical metals. With Armor-Vit (as it is called), many manufacturers are able to substitute steel or iron in their products for the even more critical materials such as brass, copper, stainless steel and aluminum. It further relieves the pressure on vital materials used for protective coatings such as chromium, zinc, tin, cadmium, as well as critical materials in some organic finishes.

This finish is essentially an alkali alumina silicate, one source of which is a new ingredient, an oil-bearing halloysite from the only known deposit in the world. There are various types of halloysites, but this particular halloysite is black and oil-impregnated, which characteristic is beneficial to the finished material.

After the application of Armor-Vit, by ordinary spraying equipment or dipping method, the curing treatment (best accomplished in an indirect-fired, air-circulating oven with proper temperature control and capable of heating to 750-800° F.), combines the ingredients of the coating into a finish said to be hard, heat-resisting and insoluble in boiling water and resistant to most acids and alkalis.

Armor-Vit is applied in either one or two coats at 0.0005-0.0010 in. thickness. For its application the metal is cleaned by ordinary cleaning methods—alkali cleaner, acid pickling and neutralizing. Sand-blasting is usually recommended for cast iron.

This new material is claimed to be an exceptional rust or corrosion resistant finish for metal products. Chicago Vitreous laboratory experiments, field work and independent, commercial laboratory tests aver that it has proved its ability repeatedly to withstand the standard 200-hour salt spray test, extended weathereometer tests, and all manner of acid and alkali tests with excellent results.

The manufacturers state that this product effectively withstands such acids as acetic, sulphuric, nitric and hydrochloric and resists such chemicals as cold, concentrated caustic soda, ethyl alcohol, toluene, ether, sodium and calcium chloride solutions, ammonium hydroxide and trisodium phosphate.

## New Washing Machine

The Washing Machine Division of the Magnus Chemical Company, Garwood, N. J., have announced a new, portable multi-purpose washing machine for cleaning a wide range of large and small metal parts.

The machine is designed and built to meet the needs of metal fabricators whose production rates do not warrant the installation of large, fully automatic washing equipment.

The machine has several noteworthy features. It is portable and so can be

# ENGINEERED INSULATION

## FOR ALL PLATING AND ANODIZING RACKS



BUNATOL is the original long life flexible insulation for use on electro-plating and anodizing racks. For more than five years it has been the widely used rack insulation in hundreds of manufacturing plants.

Now in the production of War material such as anodized aircraft parts, production hard Chrome plating; in Cadmium, Zinc, Silver, Tin and Copper plating, BUNATOL is again helping to increase production because this flexible insulation has longer life and racks and fixtures require less "time out" for repairs.

### FLEXIBLE!

The accompanying illustration shows an ordinary coil spring insulated with BUNATOL. This spring can be stretched or contracted indefinitely without cracking or peeling of the insulation. That same flexibility preserves the insulation on the spring contacts on your racks.

BUNATOL has long insulation life because of its remarkable resistance to chemical attack. It stands up in heated cleaners, acid or alkali plating baths, and is easy to apply without the use of skilled labor.

When racks are insulated with BUNATOL there is NO WASTE of critical metals and NO LOSS of current. The metal deposits only on the work and not on the rack.

The insulation remains permanently flexible and does not crack or peel on spring contacts.

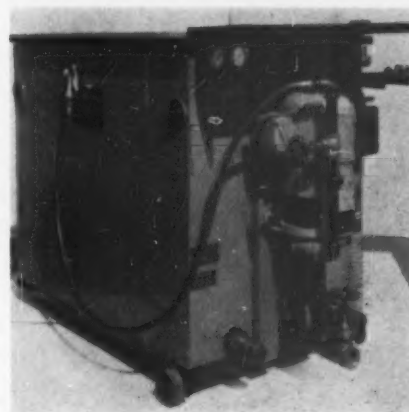
BUNATOL is now used exclusively in the production of War material and can be shipped only on high priority ratings. If you have a production problem in your plating department, BUNATOL can help. For complete information write us on your letterhead.

NELSON J. QUINN COMPANY • TOLEDO, OHIO, U. S. A.

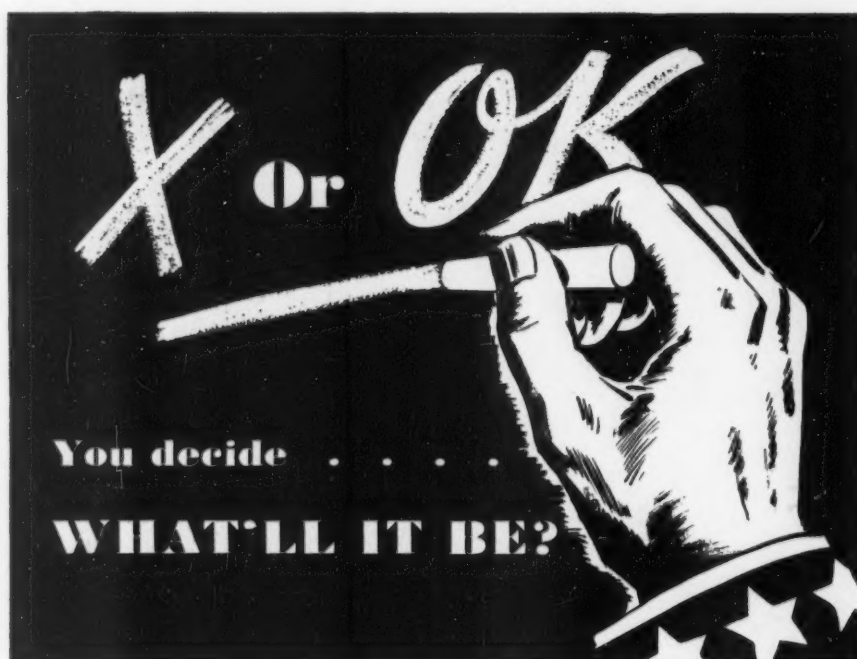
# BUNATOL

moved to the point of production when needed. The parts to be cleaned may be handled by three methods: if small and/or delicate, they are handled in bulk (in baskets); if large, they are handled individually on the lower platform, or they may be hung on racks on the solution.

The parts to be cleaned may be either soaked and agitated in baskets or on the lower platform; or sprayed with cleaning solution by means of a pump and spray gun; or both, that is, soaked in the lower section of the machine and rinsed at the upper level by means of a flush gun. The machine provides agitation of the parts by an up-and-down motion, 30 8 in. movements per minute. Several types of cleaning solution may be used.



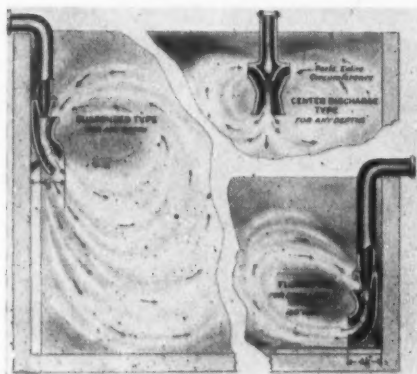
Portable washing machine.



★ In your finishing operations, be they metal, wood, plastic or what-have-you, you can erect tiny monuments to wasted man hours and lost material because of rejects. Or you can maintain a finishing schedule with a plus of increased production, better finish and lower operating costs.

It's up to you.

More and more prime and sub-contracting manufacturers are finding the answers to their finishing problems in McAleer Quality-Controlled Materials and Methods. You would be wise to put your toughest finishing problem up to McAleer where 18 years of successful industry-wide experience would be concentrated in answering your specific finishing problem . . . whether that problem meant minimizing rejects for increased production and better finish or lowering operating costs, or both. Whatever it is, let us demonstrate McAleer service on your toughest finishing problem. That's all we ask. As to results, you be the sole judge.



The above diagram shows the three new circulation steam jets announced by the Duriron Co., Dayton, O.

#### Protective Creams

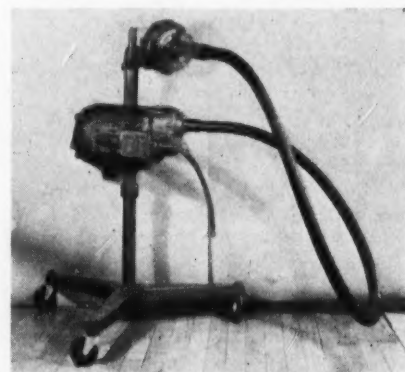
Cadet Creme Co., 151 Farrar Ave., Worcester, Mass., manufacture creams designed to prevent industrial dermatitis. One of their products—Cadet Waterproof Creme—is for use before contact with miscible cutting oils and irritants in aqueous solutions, acids, etc. Another—Cadet Protector Creme—is to be applied before working with water containing irritants and pore filling materials.

Advertised as "Invisible Work Gloves for Industry," these materials are said to be non-irritating, non-sensitizing and non-toxic. Their ingredients are claimed to be safe and medically accepted and their continued use is said to prove of actual benefit to the skin.



#### Women's Heavy-Duty Gloves

The Industrial Gloves Co., Danville, Ill., have adapted one of their steel reinforced gauntlets for women's wear—shown in the accompanying illustration. Designed on a small, comfortably fitting pattern, the gauntlet is made of sturdy chrome tanned leather, reinforced on all wearing surfaces with steel ribbons—diagonally placed for utmost protection against cuts and snags. All seams are sewed closed with steel thread. The thumb wearing surface and the junction of palm and thumb are reinforced with extra leather and steel ribbons for added protection and wear. A model with a two-inch band instead of the gauntlet is available.



#### New Geared Head Grinders

Illustrated is a new 1½ h.p. geared head grinder which furnishes a constant, high wheel speed for finishing operations. It is light in weight and vibration-free thus reducing fatigue. Both straight and angle spindles are ball bearing equipped for easier operation and longer service. These are individually powered by an electric motor to eliminate interference from other tools, and the power can be shut off immediately when working tools are not in use. A caster base or overhead trolley mounting for the motor can be furnished to provide maximum portability and permit a more efficient motor winding to dissipate operating heat. The flexible shaft follows the operator's movements. Interchangeable tools are available for wire brushing, sanding, and polishing. For further information write the manufacturer, Mall Tool Co., Dept. MF., 7740 South Chicago Ave., Chicago, Ill.

## Daché Hats for Women in Industry

Four smart models of fashion-engineered hats for women in industry have been created for Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa., by Lilly Daché—one of America's leading women's hat designers.

These attractive hats serve a double purpose, according to the manufacturer, in that they provide complete hair coverage and better head safety for women, as well as giving a lift to morale through finer appearance.

The Lilly Daché hats are cool—with free air circulation; moisture proof in that water won't harm them, and washable in soap and water. Each style fits all heads, eliminating the need to stock head-sizes.

Daché hats for women in industry are stated to be designed for their particular needs, their own best appearance and their modern protection on the job. The coveted Daché label is in every model.

The four types include the Daché Turban—a plastic mesh turban model; two styles of the Daché Helmet—with transparent acetate solid top and snood, or with laced split-top and snood; and the Daché Cap—a plastic mesh model with a high crown and a broad visor.



Daché hat for war workers.

## Potassium Cyanide in Silver Plating

The Electro-chemicals Department of E. I. duPont de Nemours & Co., Inc., Wilmington, Del., announce that in the production of silver-plated bearings for airplane motors, the rate of plating is more than trebled by the use of potassium cyanide.

Literally tons of silver are used each week in the fabrication of bearings which will withstand the high loads and terrific speeds demanded in modern wartime operations. According to some authorities, air speeds would be reduced as much as 75 miles an hour and loads would be cut substantially if silver-plated bearings were not available.

Potassium salts now are recovered by recrystallization from the vast Searles Lake salt deposits in the desert country of California. These salts provide the basic material from which potassium cyanide is manufactured at a nearby plant of the Du Pont Company.

In an electroplating bath potassium cyanide not only increases the rate at which silver plate is deposited on the motor bearings, but also gives heavier coatings that are smooth, firmly adherent, fine grained and easily machined or burnished. Coatings of silver deposited on the bearings, some of which are three to four inches in diameter, range from three to five one-hundredths of an inch in thickness, whereas silver electro-

deposits usually are measured in thousandths of an inch.

Potassium cyanide also is used in copper plating of war materials and as a nitriding agent in the surface hardening of tool steel. Before the war, virtually all the potassium cyanide used in this country came from Germany. The famous Stassfurt deposits and brine deposits in Alsace were the main sources of the potassium salts from which this cyanide was made. Halt of imports because of war threatened to delay important electroplating and surface-hardening jobs until provisions were made for the manufacture of potassium cyanide in the United States.

# BLACKENING STEEL

*on a production basis—with*



• Today, more than ever, with the increasing necessity for (1) protecting steel parts against oxidation, and (2) adapting low carbon steels to uses where high alloy steels were formerly employed but now given over to armament work—HOUGHTO-BLACK fills a real need in the metal industry.

A recent survey of the extent to which this blackening salt is being used revealed these adaptations:

1. Blackening machine gun mounts and fixtures by the ordnance plant of an aircraft company.
2. As a replacement for chrome and cadmium, a tool manufacturer is now blackening his wrenches, hack saw frames, pliers, etc.
3. Another plant, now making gun carriage parts, now HOUGHTO-BLACKENS these parts, including pins and bearings. The simplicity of the HOUGHTO-BLACK process makes it readily adaptable to the production line. It provides an attractive and protective finish without altering dimensional sizes. Ask the Houghton Man for details or write to

**E. F. HOUGHTON & CO.**

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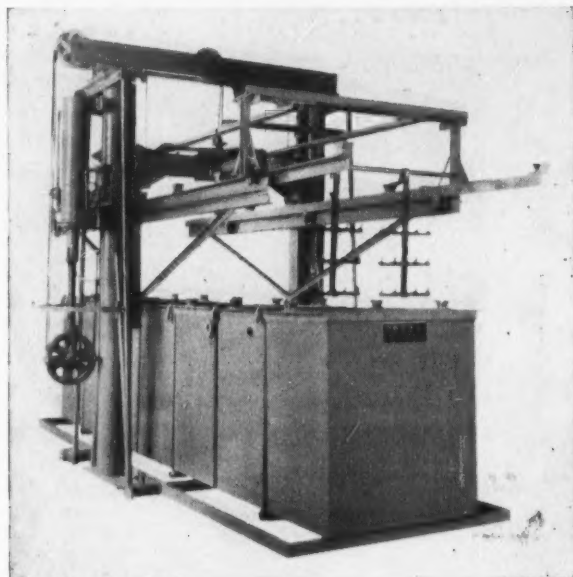
Detroit



WRITE FOR THIS FOLDER  
CONTAINS FACTUAL DATA EXPLAINING  
HOUGHTO-BLACK PROCESS



# Crown Pick-up Unit



## ...MACHINE...

A UNIT TYPE TRANSFER CAPABLE OF  
HANDLING SEVERAL TANKS  
AT ONE TIME.

## ...USE...

FOR A SERIES OF OPERATIONS WHERE THE WORK  
MUST PASS THROUGH SEVERAL TANKS, AS  
THE CLEANING AND RINSING OPERA-  
TIONS, FOR A SEMI-AUTOMATIC  
PLATING TANK.

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1910 MAYPOLE AVENUE    ::    ::    CHICAGO, ILLINOIS

**McKeon's**

*"Liquid Sulphur"*  
TRADE MARK 8800

**Strips Copper Plate**

*The Stream-lined Way*

*Safe for All Base Metals*

*Write for Sample and Advice*

**SULPHUR PRODUCTS CO.    Greensburg, Pa.**

## Manufacturers' Literature

### Blackening of Copper and Copper Alloys

To describe the company's Ebonol "C" process for blackening copper and copper alloys, *The Enthone Co.*, New Haven, Conn., have published a four-page folder. Characteristics of the coating, as well as specific operating details, are given.

### Deburring Equipment

*Frederic B. Stevens, Inc.*, Dept. MF, Larned and Third Streets, Detroit, Mich., have issued an illustrated folder describing the functions for both war production work and peace-time operation, of Roto-Finish deburring equipment and supplies.

Roto-Finish is available in both wet and dry processes. The wet process is especially adaptable for heavy gauge stampings; large, irregularly shaped parts or where a particularly smooth, bright finish is required. The dry process turns parts out clean and dry and is especially suited to the handling of brass castings, light gauge steel and brass stampings and die cast pieces before plating.

### Blackening of Aluminum and Its Alloys

A four-page folder has been issued by *The Enthone Co.*, New Haven, Conn., describing the company's Ebonol "A" process for blackening aluminum and aluminum alloys. Characteristics of the coating as well as specific operating details are given.

### ... Will Protect the Working Girl

Recognizing that the advent of women in industry presents a problem for specialized safety equipment, *The Boyer-Campbell Company*, Safety Division, Detroit, announces a catalog exclusively devoted to this purpose.

It describes equipment for the working girl's protection from head to foot, including clothing and caps by nationally known costume designers. It will be noted that none of these styles has lost sight of protection—the primary motive of clothing for the factory.

### Hoist and Crane Maintenance

Because of the pressing shortage of experienced maintenance men and the fact that most materials-handling equipment is on grueling, three-shift wartime schedules, *Robbins & Myers Inc.*, Hoist & Crane Division, Dept. MF 27, Springfield, O., has prepared a new maintenance folder to help prevent hoist and crane breakdowns that might hamper production.

This folder was the work of the company's hoist engineers and covers the various phases of maintenance necessary for trouble-free performance. In addition, it is designed to serve as a permanent file for hoist parts lists, diagrams, instruction sheets, etc., thus enabling maintenance men to keep all such essential material together for quick reference.

## Preparation of Metals Prior to Black Oxide Finishing

Degreasing, descaling and derusting methods being successfully used in preparing ferrous and non-ferrous metals for black oxide finishes are described in a new, 20-page booklet just issued by *Oakite Products, Inc.*

Marking what is believed to be the most complete yet concise compilation of technical data on this important phase of war production, the booklet gives detailed formulas and techniques for removing either drawing and stamping compounds, fabricating oils, smut, grease, rust and scale deposits from iron, steel, zinc, copper, brass, bronze and aluminum to facilitate subsequent application of black oxide coatings.

In addition, the booklet includes data on reclaiming black finished parts that have failed to pass inspection due to faulty fabrication, incorrect surface preparation or finishing. Also reviewed are the construction and operation of such surface preparation equipment as still cleaning, electro-cleaning and acidic solution tanks.

Copies of this booklet are freely available. Write to *Oakite Products, Inc.*, Dept. MF., 18 Thames Street, New York, N. Y.

## Polishing Wheels and Bobs

White Spanish felt polishing wheels and bobs as produced by *James H. Rhodes & Co.*, Dept. MF, 157 W. Hubbard St., Chicago, Ill., under the trade name "Colossus Brand," are described in a folded leaflet issued by the company.

## Equipment Catalogue

*The Chas. F. L'Hommedieu & Sons Co.*, 4521 Ogden Avenue, Chicago, Ill., have issued a new catalogue describing and illustrating various machines for plating and polishing as well as supplies used in their industry. Among the machines treated is their variable speed lathe which they claim is superior to others manufactured for the reason of its simplicity and easy operation.

Their new-type generator for anodizing is another item illustrated and the literature contains much other information pertaining to plating and polishing.

This is the company's forty-fifth year in the manufacture of plating equipment.

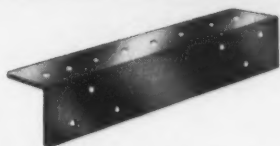
## Stripping Agent for Copper Plate

*Sulphur Products, Inc.*, Dept. MF, Greensburgh, Pa., have issued a folder describing the process employing the firm's "Liquid Sulphur" as a stripping agent for copper plate.

## Pumice

"In Times Like These It Pays To Mind Your P's and Q's" (with P standing for pumice and Q for quality), is the title of a folded leaflet published by *James H. Rhodes & Co.*, 157 Hubbard St., Chicago, Ill. The types of pumice supplied by the company are described and a brief resume given of their mining, transportation and processing.

# Cleaning Aluminium?



## Before anodizing?

**Sprex A. C.** removes all forms of shop soil, leaving the surface chemically clean and in perfect shape for anodizing, plating, or painting. No powdery residues . . . no oily solvent film.



## To remove Drawing Compound?

**Sprex A. C.** in immersion tanks or parts washing machines thoroughly removes even the most tenacious pigmented drawing compound without attacking the aluminum. No pitting . . . no discoloration.



## After machining?

**Sprex A. C.** contains a special ingredient that completely penetrates the oily film that holds metal particles, filings, emery dust, etc. to threads and orifices. When this film is dissolved all extraneous soil is easily rinsed off with water.



## To remove stencil marks?

**Sprex A. C.** cleaning action is rugged enough to remove all traces of stencil ink from sheets and blanks . . . but is inhibited to prevent any attack on the aluminum. SPREX A. C. is absolutely safe on all Aluminum Alloys. No fire hazard—used in admixture with water only.

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AVIATION CLEANER  
★  
made especially  
for cleaning  
aluminum

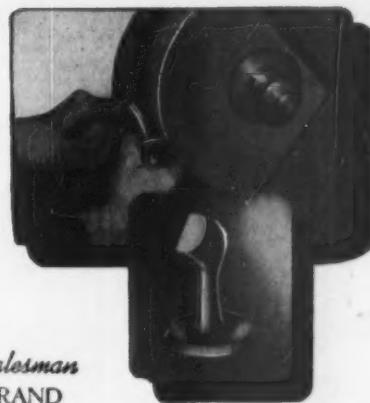
FOR MORE INFORMATION AND CASE HISTORIES WRITE TO:

*The DuBois Company*  
CINCINNATI, OHIO

TRAINED SERVICE MEN AND WAREHOUSE STOCKS IN PRINCIPAL CITIES COAST TO COAST

# FELT DOES IT BETTER

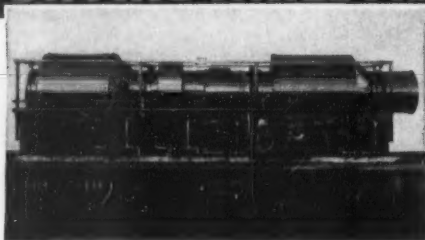
What a difference in your finished product when you use *Paramount Felt Polishing Wheels* for grease polishing—that all-important finish that swings the buyer's decision to your product.



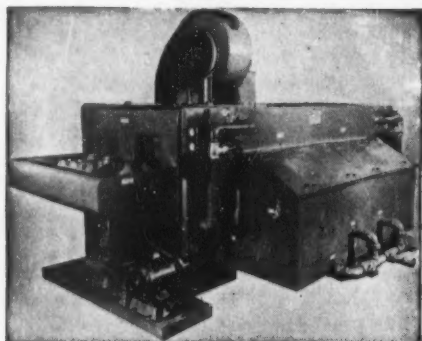
Ask your supplies salesman  
for **PARAMOUNT BRAND**

**Bacon Felt Co.**  
WINCHESTER, MASS. ESTABLISHED SINCE 1824

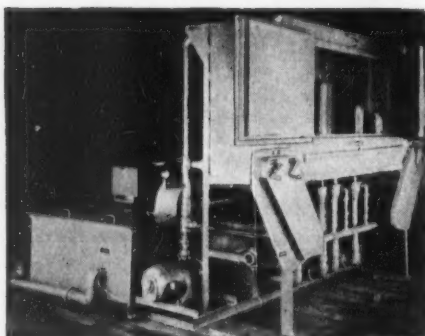
# SAVING THREE MEN OUT OF FOUR!



Shell Pickling Machine



Shell Washing Machine



Steel Container Washing Equipment

## MAGNUS MATERIALS METHODS and MACHINES for METAL TREATMENT

With a Magnus Machine in your production line using the right materials for precleaning, washing, pickling, bonderizing, or any other metal finishing operation—you can save three men out of four, compared with manual methods.

More, the work can be done with women where manual operations demand the strength of men. Magnus methods, materials and machines are designed to meet your particular problems. They speed production and solve the manpower shortage as it affects metal finishing processes.

Best of all, you won't have to wait months for your Magnus Machine.

### ASK FOR YOUR COPY

of "The Metal Cleaning Handbook"—the most complete treatise on metal finishing operations yet published.

## MAGNUS CHEMICAL COMPANY

Manufacturers of Industrial Cleaning Materials—Washing, Drying, Pickling Equipment—Metal Drawing Lubricants.

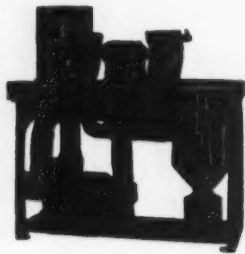
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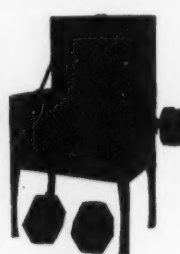
Blower



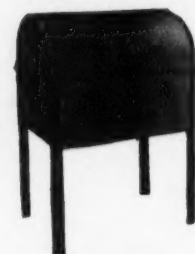
Polishing Bench



Dryer



Tubbing



Sawdust Box



Sandblast

## THE BOLAND SYSTEMS

FOR FACTORY INSTALLATIONS  
Tanks, Coloring Rooms, Dynamos, Sawdust Boxes

H. J. ASTLE & CO., INC.

Established 1884

(Send for Catalogs)

118 Orange St., Providence, Rhode Island

### New Parts from Old

Four different methods for renewing worn metal parts such as pump rods and shafts are described in a new booklet published by *The International Nickel Company, Inc.*, 67 Wall Street, New York. Using a worn pump shaft as a practical example, the booklet explains and illustrates the step-by-step procedures for reconditioning the shaft:

- (1) By machining and refinishing the worn section.
- (2) By building up and refinishing the section by welding.
- (3) By metal spraying.
- (4) By heavy and hard electrodeposition.

### Reverse Current

*MacDermid, Inc.*, Waterbury, Conn., have published a new, four-page illustrated folder on the Anodex Process and Compounds.

The cycles to be used in the process are given as are suggestions for most efficient application.

### Fan Systems

*The Kirk & Blum Manufacturing Co.*, Cincinnati, O., are the publishers of a 32-page book on fan systems as applied to various industries, among them lead products, galvanizing, tinning, roofing, insulation and processing.

The book has ample photographic data.

### Blackening of Zinc and Zinc Alloys

A four-page folder issued by *The Enthone Co.*, New Haven, Conn., describes the company's Ebonol "Z" process for blackening zinc and zinc alloys. Characteristics of the coating, as well as specific operating details, are given.

### Production Facilities Data

A 16-page book composed of photographs of sheet metal parts and assemblies and a machinery list giving sizes and specifications was issued by *The Kirk & Blum Manufacturing Co.*, Cincinnati, O.

### Steel Wool

*James H. Rhodes & Co.*, Dept. MF, 157 W. Hubbard St., Chicago, Ill., have issued a booklet on their "Beaver-Brand" steel wool which reviews the history and production of the product and describes the various units in which it is marketed.



## New Books

**Metallography.** By Cecil H. Desch. Fifth Edition. Published by Longmans, Green & Co., 55 Fifth Ave., New York, N. Y. 1942. 408 pages and appendix. Price \$8.

This work is described as "a general introduction to the subject together with a more detailed discussion of certain topics of special scientific interest."

Chapters on thermal analysis, microscopical examination, and crystallization of alloys are included. The subjects of the physical properties of alloys, electrolytic potential and corrosion, mechanical deformation, and the structure of cold worked metals are also treated.

The author states that only a limited number of references is given, but the works of over 1,100 authors have been listed. The uninitiated may recoil at the prospect of the extent of the literature on the subject, or he may use the book as a starting point to investigate some particular section of the field, especially in its more theoretical aspects.

The book has been used for many years in the teaching of metallurgical students in Glasgow and Sheffield. Those who take up the book for the purpose of understanding the metallographic examination of metals will find the association of a teacher advantageous. Sketches to illustrate mechanical actions and constructions are used with frugality, but there are many

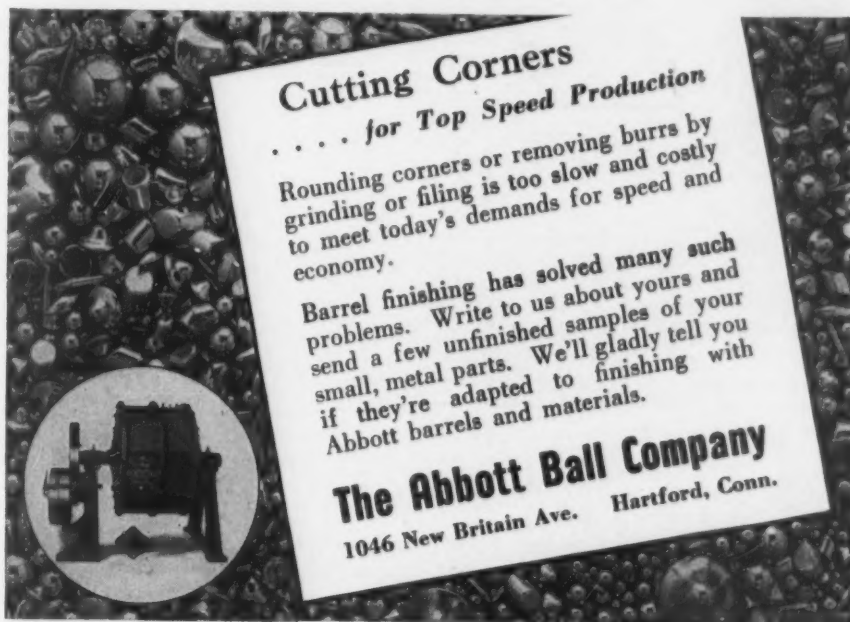
excellent photomicrographs. Those who appreciate the meaning of the latter will have had the training to fill in the gaps of the elementary explanations and to them the book is recommended.

**1943 Plating and Finishing Guidebook.** Published by Metal Industry Publishing Co., 11 West 42nd St., New York, N. Y.

Ready for distribution late this month, the new Guidebook, in addition to its regular features, contains chapters on hard chromium plating, heavy gold plating to speci-

fication, the proper operation of caustic blackening units, heavy and hard nickel plating and chemical treatments for protecting magnesium. Another division which should prove interesting to metal finishers consists of formulas and tables dealing with conversion of specifications calling for milligrams per square inch to thickness of deposit.

Paint, varnish and lacquer users should find the enlarged Organic Finishing Section in this edition particularly valuable. It contains chapters on blushing of lacquers, properties of flammable solvents, a glossary of color terms, etc.



**Cutting Corners**  
 . . . . for Top Speed Production

Rounding corners or removing burrs by grinding or filing is too slow and costly to meet today's demands for speed and economy.

Barrel finishing has solved many such problems. Write to us about yours and send a few unfinished samples of your small, metal parts. We'll gladly tell you if they're adapted to finishing with Abbott barrels and materials.

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 1046 New Britain Ave. Hartford, Conn.

# BUCKINGHAM COMPOUNDS

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## WAR PRODUCTION

**BURRING • GREASELESS  
 HARDENED STEEL COMPOSITION**

*Samples Shipped Promptly*

**THE BUCKINGHAM PRODUCTS CO.**

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**DETROIT, MICH.**

# Clean All Metals With Permag Compounds

## Permag Ferro-lyte

—Anodic Steel Cleaner used at low concentrations.  
Time tested and approved by leading industries.

## Permag Cupro-lyte

—Cathodic Cleaner for Brass, Copper and their alloys.

## Permag Aluminum Cleaner

—For Aluminum prior to anodizing and finishing,  
and for other White Metals—Zinc and Lead Die-Cast, etc.

*Write for recommendations to  
obtain correct materials for your job.*

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## **BLACK-MAGIC**

*"The one bath process"*

for steel.

Preferred by the nation's outstanding industries.

An accepted finish for small arms, steel ammunition, fuse parts, Chemical Warfare, Quartermaster Depot, Air Corps, Signal Corps and other items.

"775,000 machine gun magazines without a single rejection".

Report of one BLACK-MAGIC user.

WITCH-DIP, a wax base rust resistant finish application for steel and iron.

*Write for portfolio of complete information.*

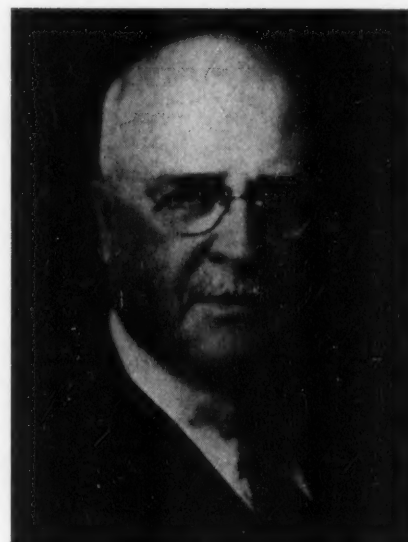
**MITCHELL-BRADFORD CHEMICAL CO.**

BRIDGEPORT, CONN.

*Substitutes.* By H. Bennet. Published by Chemical Publishing Co., 243 King St., Brooklyn, N. Y. 1943. 225 pages. Price \$4.

While the main portion of this book gives a list of chemicals and materials with possible substitutes for them, this section comprises only part of its value. Much helpful information is contained in the preliminary chapters, in which are described methods of starting the search for a substitute. Certain principles are laid down so that the substitute, if existent, may be found systematically rather than by blind cut and try. The author himself is responsible for the development of many substitute materials.

## **Obituary**



### **Harry Herbert De Loss, Handy & Harman Director, Dies**

Harry Herbert De Loss, a native of Chicago, Ill., and a director of Handy & Harman, New York, passed away March 28th at Clearwater, Fla.

Mr. De Loss served the company in many capacities. He joined the organization in 1900 when the Standard Metal Company of Chicago, of which he was principal owner, was absorbed by Handy & Harman and two years later moved to Bridgeport, Conn., where he made his home until his death.

For years he had charge of the company's John Street Plant in Bridgeport and was responsible for the original development of the silver and gold refining and manufacturing activities of the company. The site for the present Handy & Harman plant was selected by him in 1915 and the plant built under his direction.

Mr. De Loss served in the capacity of Vice-President in charge of Manufacturing for many years, during which the company established itself as a leading factor in producing precious metals. He was treasurer of the company from 1905 to 1915, vice-president 1915-1923 and a director from 1905 until his death.

## Associations and Societies

### The Electrochemical Society's New President

Dr. Robert M. Burns was born at Longmont, near Denver, Colo., in 1890 and spent his boyhood in the western part of the state which had been recently relinquished by the Ute Indians. He attended Colorado State University at Boulder and was graduated in 1915. For the following two years he remained as an instructor in the chemical department. Graduate work in chemistry at Princeton culminated in 1921 when he received his Ph.D. degree. In 1918 he had been commissioned Second Lieutenant in the Chemical Warfare Service and sent to France.

In 1921 Dr. Burns became a research chemist for the Barrett Company, and for a year was employed upon an investigation of the catalytic oxidation of hydrocarbons. In 1922 he joined the engineering department of the Western Electric Company which in 1925 became the Bell Telephone Laboratories. Since 1931 he has been assistant chemical director of this organization.

Dr. Burns is senior author of the monograph "Protective Coatings for Metals". His principal researches have been in the field of electrochemistry and corrosion. His corrosion studies have had to do largely with the nature of corrosion reactions and their measurement by electrochemical techniques. He has contributed to the development of corrosion preventive methods and the evaluation of protective coatings.



Dr. Robert M. Burns

*Speed* ACID PICKLING the  
DOUBLY SURE\* Way  
with Enthone Acid Addition Agent



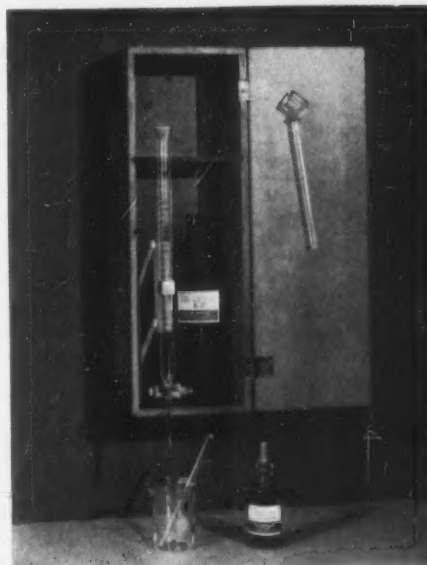
★ FASTER PICKLING — the acid rapidly penetrates under rust and scale, thus LIFTING THEM OFF!

★ SAVES ACID — Drag-out is materially reduced and acid is saved by inhibiting action.

OVERCOMES WATER-BREAK IN PICKLING — Due to poor alkaline cleaning or soap in the alkaline cleaner, water-breaks appear on acid dipping before plating. The use of ENTHONE AAA in the acid literally makes the acid a cleaner and overcomes peeling due to faulty cleaning.

Write today for FREE Trial SAMPLE and  
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THE **Enthone** COMPANY  
NEW HAVEN CONNECTICUT



## CONTROL ALKALINE CLEANER AND ACID PICKLE SOLUTIONS

New analytical sets developed  
for rapid control of cleaning  
and pickling solutions.

WRITE FOR LITERATURE

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# CHROMIC *Acid*

## 99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.

BICHROMATE OF SODA  
BICHROMATE OF POTASH

*Mutual Chemical Co. of America*  
270 MADISON AVENUE, NEW YORK



Norman F. Smith

### Osborn Executive Named President of American Brush Manufacturers

Norman F. Smith, vice-president and general manager of *The Osborn Manufacturing Co.*, 5401 Hamilton Ave., Cleveland, O., was elected president of the American Brush Manufacturers Association at the 26th annual convention of that organization held at Rye, N. Y.

Mr. Smith is one of three sons of *Franklin G. Smith*, president of the Osborn Company, producers of industrial brushes and foundry moulding machines.

After graduating from Dartmouth College with a B.S. in 1925, he became associated with Osborn and has been active with that company for the past 18 years.

In his new post as president of the American Brush Manufacturers Association, Smith will assist in directing the increased activities of this organization for rendering service to each of the association's 162 member companies in meeting emergency conditions arising from expanded war production.

**NOW**  
IS THE TIME FOR SPEED-PRODUCTION  
AND

**VICTORY** TO HELP ACHIEVE THIS END

USE  PRODUCTS

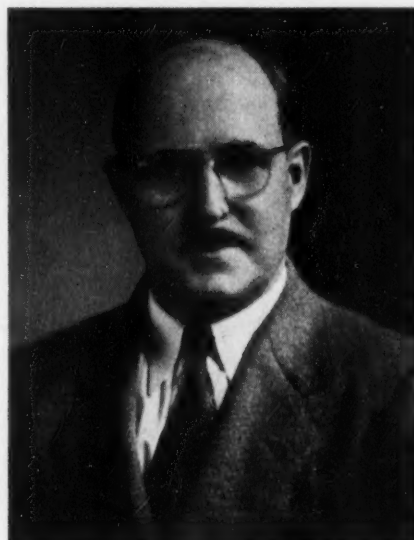
**4A CEMENT and THINNER** Used for setting-up wheels, belts, buffs, rolls—they are free cutting, long lasting and economical when set up with 4A Cement.

**COLORING ROUGES** Uniform, carefully graded raw materials, expertly compounded by Harrison's technicians, insure rouges that give high luster and faultless finishes.

**POLISHING COMPOUNDS** 4A symbolizes SUPERB PERFORMANCE, which you will find in our compounds for CUTTING, CUT AND COLOR, AND MIRROR FINISHING all kinds of steel including stainless steel, carbon steels and hard-to-buff alloys.

SAMPLES ON REQUEST

**HARRISON and COMPANY**  
HAVERHILL, MASS.



Percy L. Stapleton

Mr. Stapleton is the new president of the Plating and Rustproofing Association of Michigan.

## American Electroplaters' Society Annual Convention

Arrangements are being completed for the Annual Convention of the American Electroplaters' Society to be held in the Hotel Statler, Buffalo, N. Y., on June 7th, 8th and 9th.

All convention activities are scheduled to take place in the Statler but other hotels within walking distance are the Ford, Graystone, Lafayette, Buffalo and Touraine.

It cannot be emphasized too strongly that reservations be made early, since hotel accommodations are limited.

### Los Angeles Branch

As a result of various statements that a movement is gaining headway among eastern branches of the A.E.S. to bring about an increase in the per capita tax for branches, a discussion held at the April 1 meeting of Los Angeles Branch of the A.E.S. intimated that members of that branch were inclined to the opinion that an increase in the per capita tax was inappropos at this time.

It was suggested that a resolution embodying the branch's sentiments against an increase be prepared and submitted at the May meeting for consideration.

James ApRoberts recommended that a more impressive initiation ceremony be used for inducting new members into the branch. For a number of years Los Angeles branch has been confining the ceremony for initiat-

ing new members to reading to the candidates a prepared statement, in the form of a pledge, which outlines the aims and purposes of the society and emphasizes to them the educational value of its program. While this rite is invested with a degree of solemnity, the entire ceremony lasts little more than five minutes. It was Mr. ApRoberts' contention that a ceremony could be devised which would impress initiates to a greater degree with the privilege which they are being accorded in being accepted into the A.E.S.

Chairman Emmette R. Holman appointed a committee, headed by Frank Bunker, to study procedures for initiating new members and to make a report on their findings at the May meeting. Earl Coffin and Stanley Rynkofs were named to assist Mr. Bunker.

The branch voted that copies of a paper entitled "Zinc, Saboteur of Steel at Elevated Temperatures" be sent to Dr. William Blum at the Bureau of Standards in Washington. This paper, prepared by Franklin Page, Jr., laboratory foreman of the Solar Aircraft Co., San Diego, attracted considerable attention when it was read at the March 20 educational session of the branch because of the serious situation in zinc which it apparently brought forth. The branch decided the subject was worthy of being called to the attention of Dr. Blum with the request that he forward copies of the paper to the War Production Board and to aviation authorities at Wright Field.

In the annual election of officers, Emmette

R. Holman of Turco Products, Inc., was unanimously re-elected for the 1943-44 term as president. Other officers elected at this meeting were: first vice-president, Joseph Sunderhouse; second vice-president, Ed Wells; librarian, Earl Coffin; secretary-treasurer, F. Herr; sergeant-at-arms, Stanley Rynkofs. The incumbent Board of Managers, consisting of Ernest Lamoreaux, John Merigold and Don M. Bedwell, was re-elected.

Forest Grame, a hard chrome plater with Phelps Dodge Corp., was accepted into active membership; and F. Carl Hirdler, Jr., of the Turco Products, Inc., laboratory staff, into associate membership.

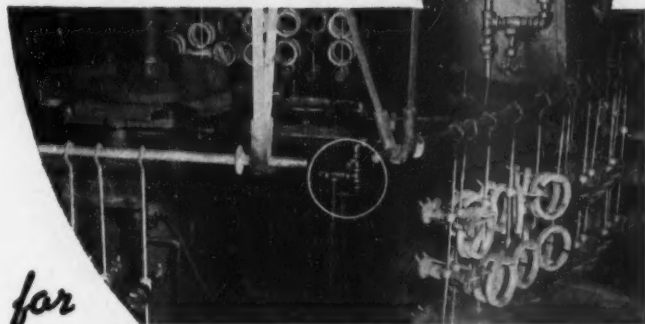
### Leacrest Party

The annual stag party at the home of Bob Leather, president of The Lea Manufacturing Co., Waterbury, Conn., will be held at Leacrest, Bethlehem, Conn., on Saturday, May 29th, from 1 p. m. on. Trap shooting, horse shoes, archery, baseball, etc., are scheduled.

All interested in, or engaged in, any phase of metal finishing, burring, polishing or plating are welcome. Tariff: \$1.00.

An effort will be made to advise those who write or telephone the company of their intention of attending of everyone else in their vicinity who also expects to go and in this way an opportunity will be given for ride sharing.

## SARCO CONTROL is Standard—



for

### BULLARD-DUNN PROCESS

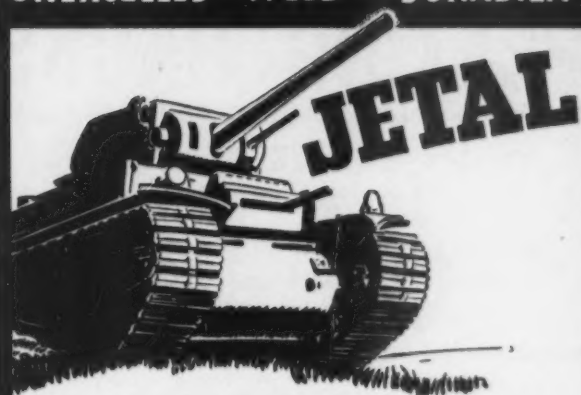
The photograph above shows a typical Bullard-Dunn Process unit using a Sarco Thermoton for temperature regulation. The Bullard-Dunn Process removes scale and oxide completely from steel surfaces without etching. It cleans out recesses as well as flat surfaces. These are the reasons it is being used so widely in the manufacture of airplane engines, machine guns, tank transmissions, aircraft bearings, aviation instruments and the like. Sarco is proud to share in this important war work by keeping the Bullard-Dunn baths at their most efficient operating temperatures.

142

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## News from California

By Fred Herr

The manpower shortage in metal finishing circles in San Diego, Calif., is so acute that the average personnel ratio of the *San Diego Plating Co.*, 836 Columbia St., has been 75% women to 25% men since the first of the year.

George J. Russell, proprietor, declared that on some days the percentage of women is even greater. There have been days, he stated, when he was the only man on the job, assisted by six or seven women.

Experienced plating shop men are so scarce in war-glutted San Diego that it is practically impossible to hire one for an independent shop. The plating rooms of aircraft plants get the pick of the field.

Russell is fairly well sold on women workers for plating shops. He contends that for some types of work—wiring and hanging in the tank, for instance—women are actually better than men. He has found that they are not quite as efficient as men at polishing, however. Russell is of the opinion that, on the whole, women are inclined to be more conscientious and reliable at certain types of work which require close application and at which technical knowledge is not paramount. All the heavy work, particularly chrome work, in Russell's shop is handled by men.

Russell's company is housed in the building formerly occupied by the Carter Plating

Co. When Mr. Carter died a year ago, Russell took over the plant and equipment and merged it with his own. He operates with zinc, chromium, silver, nickel and copper tanks, and has recently installed three cadmium tanks.

*Aviation Spray Works*, Hollywood, Calif., is another firm which employs a large percentage of women. Of the 10 employees, six are women—two blondes, two brunettes and two red-heads. This firm is doing considerable work on tail assemblies for dive bombers, spraying zinc chromate on cadmium and zinc by the spray-gun and booth method.

*DeLuxe Plating Co.*, 1242 Valencia St., Los Angeles, is installing a zinc setup, including a 350-gallon tank, 8 ft. long 4 ft. wide and 3 ft. deep, as well as auxiliary equipment.

With its plating work considerably reduced in recent months, this firm now is heavily engaged in polishing and burnishing aluminum airplane parts. *Gene Bedwell* and *Al Huntely* operate the plant.

*F. Carl Hirdler, Jr.*, former process engineer for Southern California airplane plants, has affiliated himself with *Turco Products, Inc.*, Los Angeles, as a member of the laboratory staff. He is a graduate of the University of Oklahoma with a B.S. degree in chemical engineering.

*Thomas E. Farley*, Hollywood, has announced discovery of rich silver-lead ore in the Williams property in the Bear River field near Grass Valley, Calif. The deposits are reported by Farley and *George H. Hook* of Auburn, Calif., to occur in a limestone area surrounded by intrusions of amphibolite and Horneblende schist and diabase. Hook, who is completing a geological survey of the property, reported the ore to be the first of this type in the Grass Valley area and that mineralization and geological conditions resemble those at Leadville, Colo.

The demand for tin created by the war effort has brought the old Temescal tin mine, southwest of Riverside, Calif., back into the limelight. Engineers of the *Dodge Construction Co.*, Fallon, Nev., on April 10 began building a new mill at the abandoned tin mine located near the Lake Matthews highway in Riverside County, and expect to open a 200-foot tunnel. From this tunnel an English company, until a few years ago, extracted high-grade tin ore.

A new road is being constructed by the Riverside County Board of Supervisors to expedite delivery of heavy mining machinery. It is reported that old veins of tin ore are to be re-tapped and that the slag heap as well will be worked over with modern equipment to recover additional tonnage.

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by Joseph Novitsky

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Construction was started April 1 on a \$1,750,000 factory at Los Angeles which will manufacture the first ferrous and alloy metal tubing produced on the Pacific coast.

Capital for the project has been supplied by the *Defense Plant Corp.* and the factory will be operated under lease agreement by the newly organized *Pacific Tube Co.* Completion is expected in 90 days, under "rush" orders from the War Production Board. *Pacific Tube Co.* is moving several steel factory buildings from Texas, where they have been idle for some time, and is shipping used machinery into Los Angeles from various other parts of the country. Products of the plant will include cold drawn seamless tubes of carbon steel and alloy steel in all forms, grades and tempers.

*Clarence A. Warden, Sr.*, of Philadelphia, is president of the company; *Clarence A. Warden, Jr.*, vice-president and treasurer; and *F. G. Harmon*, San Francisco, executive vice-president.

*Robert Gripp* of the *Cadmium Nickel Plating Co.*, Los Angeles, was the victim of a painful accident at work which had him maneuvering about the job on crutches for several weeks in March and early April. A 35-pound copper anode dropped from a height of five feet and struck edgewise across Mr. Gripp's right foot, fracturing the arch bone.

*Rheem Manufacturing Co.*, 4361 Firestone Blvd., Los Angeles, has installed

anodizing equipment consisting of a tank 20 ft. long, 5 ft. wide and 6 ft. deep, supplied by *Pacific Fabrication Co.*, and a generator by *Superior Electric Co.* The setup is being used for anodizing work on bomb doors, motor cowlings and other aircraft parts.

*O'Connor Plating Co.*, operated at 926 East Pico Blvd., Los Angeles, by *R. J. O'Connor*, is one of the busiest plants in Southern California in the field of alumilite plating of aluminum aircraft parts on sub-contract for plane factories in the Los Angeles area. The firm keeps a 1,000, a 1,200 and a 1,500 gallon alumilite tank busy, as well as a 2,100 gallon cadmium tank.

In a patriotic gesture, the *U. S. Spring & Bumper Co.*, Los Angeles, has undertaken to manufacture at cost bolo knives to complete the equipment of several thousand Filipinos being trained in California for jungle warfare.

Since the army does not include bolo knives as standard equipment, but makes no objection to them, the Los Angeles Chamber of Commerce has appointed a Filipino Bolo Knife Committee to raise funds with which to present 5,000 bolos to the trainees. A bolo knife and scabbard cost \$5, without profit to anyone. *U. S. Spring & Bumper Co.* has agreed to produce them according to specifications of army officials, and absorb all administrative and engineering costs.

A suit brought by *Berg Metal Co.*, Los Angeles, to free the concern from further compliance with OPA regulations, backfired in Federal Court at Los Angeles on April 12 and left the firm in the position of defending itself against an OPA counter action.

The company had sued the OPA and Price Chief Prentiss Brown in an effort to obtain an injunction to stop what was termed "... needless documentary red tape."

The claims of the Berg company officials attracted widespread attention, especially their assertion that in the last year the company has had to file 96,000 documents to record 6,000 transactions.

When the case came to trial, Federal Judge Benjamin Harrison upheld the OPA contention that the district court held no jurisdiction, since Prentiss Brown's legal residence was Washington and not Los Angeles.

This left Berg Metal Co. facing a charge filed by the OPA as a counter-suit of conducting transactions above the ceiling price. The OPA requested that the firm be enjoined from further similar practices.

*Ray Hillebert*, formerly a chemical sales engineer for the *L. H. Butcher Co.'s* Los Angeles branch, now a lieutenant in the Chemical Warfare Service, stationed in New York City, was a recent visitor to Los Angeles on leave.



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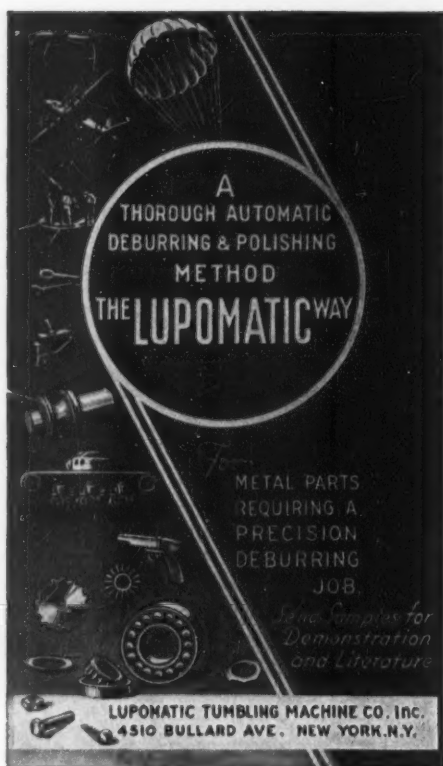
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E. C. Bullard, vice-president and general manager of the Bullard Co., makers of vertical turret lathes and Mult-Au-Matics at Bridgeport, Conn., marked his 25th year with the firm on March 18. He was guest of the Bullard Foremen's club at a dinner attended by 200 members and friends.

Glyco Products Co., Inc., Brooklyn, have moved their administrative offices to larger quarters. Since April 15th, they have been located at 26 Court St., Brooklyn, New York. The telephone number will remain MAin 4-1760.

Dr. Leo Schapiro, until recently assistant chief metallurgist at the U. S. Steel Corp. South Works at Chicago, is now associated with the Southwest Steel Rolling Mills, 9901 So. Alameda St., Los Angeles, as chief metallurgist and general superintendent.

Wayne McCarthy, former sales-service representative for the J. B. Ford Sales Co., Los Angeles, has affiliated himself with Turco Products, Inc., 6135 So. Central Ave., Los Angeles, in a sales and service capacity. Before joining the staff of the J. B. Ford Sales Co. at Los Angeles, McCarthy worked out of that company's Kansas City, Mo., office for 13 years, calling on metal finishing, galvanizing and porcelain plant operators.

New incorporations include the following: Magnesite Co. of America, capital stock 20,000 shares, no par; directors, David Grensburg, Irving Bromberg and M. Lieben-son, all of Los Angeles.

DelVina Tool & Machine, Inc., Union Bank Bldg., Los Angeles; directors: Irwin Honeyball, Myrlin J. Plummer, and Josephine Plummer, Pasadena.

Mammoth Castings, Inc., capital stock \$50,000; 324 So. Spring St., Los Angeles. Directors: A. W. Ballard, Dr. E. R. Woodruff, and Arthur V. Ballard, all of Los Angeles.

## Business Items

Employees and management of the Advance Plating Co., Detroit, Mich., are sharing their wartime wages and profits with fellow-workers who have entered the armed services.

Each week a \$25 war bond is bought for former employees now in service. Half the cost is borne by the management, while workers contribute the rest.

The plan was proposed by Bernard M. Baur, head of the company, after he gained control of the concern two months ago. Three employees who have entered the army since that date are now getting the bonds; three others leaving in a few days will start receiving bonds as soon as they are inducted.

Three additions to the sales and service staff of Wheelco Instruments Co., Chicago, Ill., have been announced by R. A. Schoenfeld, vice-president and sales manager. Hugh Acock, formerly in the Tulsa territory, has been named Texas district manager with headquarters in Houston. C. H. Garrison has been named Kansas City representative, with a territory including western counties of Missouri. Russell George has been added to the sales and service department of the company's Combustion Safeguard Division, with headquarters in Chicago.



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Philadelphia Quartz Co., 121 S. Third St., Philadelphia, Pa., manufacturers of sodium silicates and Metso Detergents, have announced the appointment of LeRoy R. Fischer as assistant sales manager of detergents.

Mr. Fischer, a chemical graduate of the University of Wisconsin, joined the sales staff of the company in 1934, operating from the Chicago sales office. In 1935 he was transferred to the Philadelphia office.

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Electroplating and Govt. Restriction—W. W. McCord, W.P.B.

Military Applications—Wm. Blum,  
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# Supply Prices, April 26, 1943

## Anodes

Prices are f.o.b. shipping point on quantities of from 500-999 lbs. for copper, brass and zinc. For nickel, prices are for quantities from 500-2,999 lbs.

COPPER: Cast, elliptical, 15" and longer	25½c. per lb.	ZINC: Cast, 99.99, 16" and over	16¼c. per lb.
Electrolytic, full size, 22½c.; cut to size	22½c. per lb.	NICKEL: 95-97 cast, elliptical 46c. per lb., 99% plus	
Rolled, oval, straight 15" and longer 23¼c. per lb.; curved	24¼c. per lb.	cast 47c.; rolled, depolarized	49c. per lb.
BRASS: Cast, 80-20, elliptical, 15" and longer	23½c. per lb.	SILVER: Rolled, 999 fine per Troy (100 oz. lots)	49½c. per oz.

## Chemicals

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone, C.P., dms., l.c.l.	lb.	.09	Lead, Acetate (Sugar of Lead), cryst., bbls.	lb.	.125
Acid, Acetic, glacial, 99.5%, bbls.	lb.	.0940	Oxide (Litharge), com., powdered, bbls.	lb.	.09
Boric, tech., 99.5% gran., bbls.	lb.	.0635	Lead, White, dry bbls.	lb.	.085
Chromic, 99%, 100 lb. dms., l.c.l.	lb.	.1725-.1825	Magnesium Sulfate (Epsom Salts), tech., bbls.	lb.	.019
Hydrochloric (muriatic) tech., 20°, cbys., wks.	lb.	.0175	Mercury Bichloride (Corrosive Sublimate), cryst.	lb.	\$2.39
Hydrochloric (muriatic) C.P., 6 lb. bottles	lb.	.19	Mercuric Oxide, tech., red, powder, bbls.	lb.	\$3.26
Hydrofluoric, 30% wooden bbls.	lb.	.06	Mineral Spirits, tanks	gal.	.10
Hydrofluoric, 48%, lead cbys.	lb.	.12	Naphtha, V. M. & P., tanks	gal.	.11
Nitric, 36°, cbys. 1-9, wks.	lb.	.0595	Nickel, Carbonate, dry, bbls.	lb.	.36-.365
Nitric, 42°, cbys. c.l., wks.	lb.	.065	Chloride, bbls.	lb.	.18-.20
Oleic (Red Oil), dms.	lb.	.1325-.1425	Salts, single, 425 lb. bbls.	lb.	.13-.135
Oxalic, small quantities	lb.	.125	Salts, double, 425 lb. bbls.	lb.	.135-.145
Phosphoric, 75%, c.l., cbys.	lb.	.0510-.0535	Paraffin, refined, 123-125 A.M.P.	lb.	.052
Stearic, double pressed, bags	lb.	.15-.16	Perchloroethylene, dms., l.c.l.	lb.	.085
single pressed, bags	lb.	.1425-.1525	Potash, Caustic, 88-92%, flake, wks., c.l.	lb.	.07
triple pressed, bags	lb.	.18-.19	Potassium, Bichromate, casks	lb.	.10
Sulfuric, 66°, cbys., c.l., wks.	lb.	.015	Carbonate (potash) calc., wks., dms.	lb.	.065
Alcohol, Amyl (Fusel oil, ref'd), l.c.l.	lb.	.151	Cyanide, 94-96%, dom. dms., wks.	lb.	.55
Butyl-normal, l.c.l.	lb.	.1225-.1575	Nitrate, rfd., gran., bbls.	lb.	.086
Denat., S.D. #1, 190 pf., bbls., c.l., wks.	gal.	.62	Permanganate, tech., dms., wks.	lb.	.1975-.2025
Diacetone, tech., dms., l.c.l.	lb.	.115-.14	Phosphate, dibasic, ¼ lb. bottles	lb.	.91
Methyl, (Methanol), synthetic, dms., l.c.l. gal.	gal.	.37	Pumice, ground, 1½ F. & coarser, bbls., wks.	lb.	.045
Propyl-Iso, 99%, dms. l.c.l.	gal.	.47	Quicksilver (Mercury), f.o.b. West Coast, 76 lb.	flask	\$191.00
Propyl-Normal, dms., wks.	gal.	.67-.70	flasks, net	flask	
Alum, ammonia, granular, bbls. wks.	lb.	.04	Rochelle Salts, crystals, bbls.	lb.	.44-.47
Potash, granular, bbls., wks.	lb.	.0425	Rosin, gum, D dms., dock	lb.	.0357
Aluminum Sulfate, iron-free, bgs., c.l., wks.	lb.	.02-.0210	Silver, Chloride, dry, 50 oz. lots	oz.	.455
Ammonia, aqua, 26°, cbys.,	lb.	.0525	Cyanide, 100 oz. lots	oz.	.41½
Ammonium, chloride (sal-ammoniac), white granular, bbls., wks.	lb.	.0515	Nitrate, 100 oz. lots	oz.	.32½
Ammonium, Sulfate, dom. bulk	ton	\$29.20	Sodium, Acetate, flake, gran., powd., 60%, dms., l.c.l.	lb.	.055-.06
Sulphocyanide (thiocyanate) tech., bbls.	lb.	.17	Bisulphite, powd., bbls., l.c.l., wks.	lb.	.0350-.0360
Antimony Chloride (butter of antimony), sol., cbys.	lb.	.17	Bicarbonate, tech., bbls., l.c.l.	lb.	.0205
Arsenic, White, powd., keg, l.c.l.	lb.	.0475	Carb. soda ash), light, 58%, bags, l.c.l.	lb.	.0213
Barium Carbonate, pptd., bags, l.c.l., wks.	lb.	.03	Citrate, U.S.P., kegs, 100 lb. lots	lb.	.25
Benzene (Benzol), 90%, dms., wks.	gal.	.20	Cyanide, 96%, dom. 100 lb. dms.	lb.	.15
Borax, tech., bgs.	ton	\$61.00	Dichromate, l.c.l., wks.	lb.	.0715-.0775
Butyl Lactate, dms.	lb.	.205	Hydroxide (caustic soda) 76%, flake, l.c.l.	lb.	.0355-.049
Cadmium Oxide, l.c.l., bbls.	lb.	.95	Metasilicate, granular, 1-9 bbls.	lb.	.0355
Calcium Carbonate (Pptd. chalk), c.l., wks.	lb.	.02	Nitrate, rfd., gran., bbls., wks.	lb.	.04
Calcium Chloride, flake, paper bgs, 5-ton lots	ton	\$28.50-\$41.00	Nitrite, 96-98%, dom., bbls., l.c.l.	lb.	.089-.119
Carbon Tetrachloride, l.c.l., 52½ gal. dms.	gal.	.80	Phosphate, dibasic, cryst., bags, l.c.l., wks.	lb.	.0295-.0345
Cobalt Sulphate, dms.	lb.	.65	Phosphate, tribasic, l.c.l., wks.	lb.	.0415
Copper, Acetate (verdigris), bbls.	lb.	.26-.35	Orthosilicate, anhyd., 1-2 dms.	lb.	\$5.45-\$5.85
Carbonate, 52-54%, bbls.	lb.	.195-.205	Pyrophosphate, anhyd., bags, c.l., wks.	lb.	.0528-.0610
Cyanide, tech., 100 lb. bbls.	lb.	.34-.38	Sesquisilicate, l.c.l.	lb.	.0405-.043
Sulfate, 99%, crystals, bbls., 1-5	lb.	.0565	Stannate, dms.	lb.	.325-.365
Cream of Tartar (potassium bitartrate), kegs	lb.	.585	Sulfate, anhyd., bbls., wks.	lb.	.022-.024
Crocus Martis (iron oxide), bbls., c.l.	lb.	.09	Sulfide, cryst., bbls., less than 5 tons	lb.	.0315
Dextrin, white, bags, l.c.l., F.O.B. Chicago	lb.	.0415	Sulfocyanide, C.P., dms.	lb.	.55-.65
Diethylene Glycol, dms., l.c.l., wks.	lb.	.155	Thiosulfate, cryst., bgs., wks., c.l.	lb.	.0225
Emery (Turkish)	lb.	.08	Sulfur, Flowers, U.S.P., l.c.l.	lb.	.034-.0355
Ethyl Acetate, 85%, l.c.l., dms.	lb.	.122-.125	Tin Chloride, crystals, bbls.	lb.	.39-.395
Ethylene Glycol, l.c.l., dms.	lb.	.165	Toluene (Toluol), 2°, ind., dms.	gal.	.33
Monoethyl ether, dms., l.c.l.	lb.	.125-.155	Trichlorethylene, dms., l.c.l.	lb.	.085
Gold, Chloride, yellow, 4 oz. bottles	oz.	\$19.00	Tripoli, air-floated, bgs., c.l., wks.	ton	\$21.50
Cyanide, potassium 41%, bottles, wks.	oz.	\$14.20-\$14.95	Wax, Bees, yellow, crude	lb.	.4475
Cyanide, sodium (46%)	oz.	\$17.10	Carnauba, refined, bags	lb.	.7675-.80
Gum, Arabic, white, bgs.	lb.	.33-.35	Spermaceti, blocks	lb.	.26-.27
Hydrogen Peroxide, 100 vol., cbys.	lb.	.16-.185	Whiting, chalk, l.c.l.	ton	\$20-\$24
Iron Chloride (ferrous), cryst., l.c.l., f.o.b., Midland, Mich.	lb.	.035	Xylene (Xylol), ind., returnable dms., wks.	gal.	.32
Iron Chloride (ferric), cryst., bbls.	lb.	.05-.08	Zinc, carbonate, tech., bbls.	lb.	.14-.20
Iron Sulfate (Copperas), cryst., bbls., 1-4 wks.	lb.	.02	Cyanide, 100 lb. kegs	lb.	.33-.37
			Chloride, tech., granular, dms., c.l., wks.	lb.	.0575
			Dust, bbls., l.c.l., wks.	lb.	.1135
			Oxide, lead-free, bbls., l.c.l.	lb.	.0775
			Sulphate, crystals, bbls., l.c.l.	lb.	.046



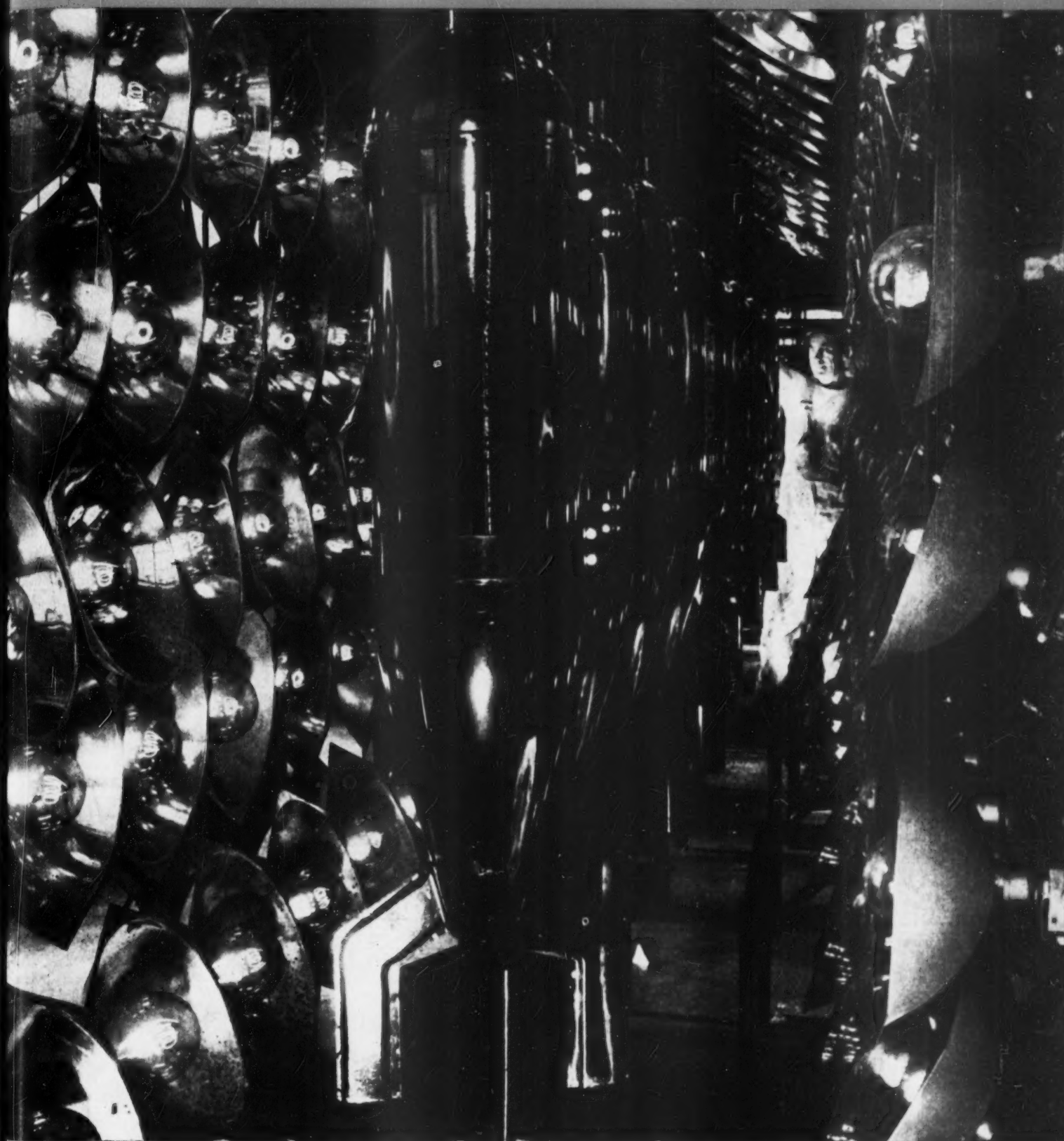




MAY, 1943

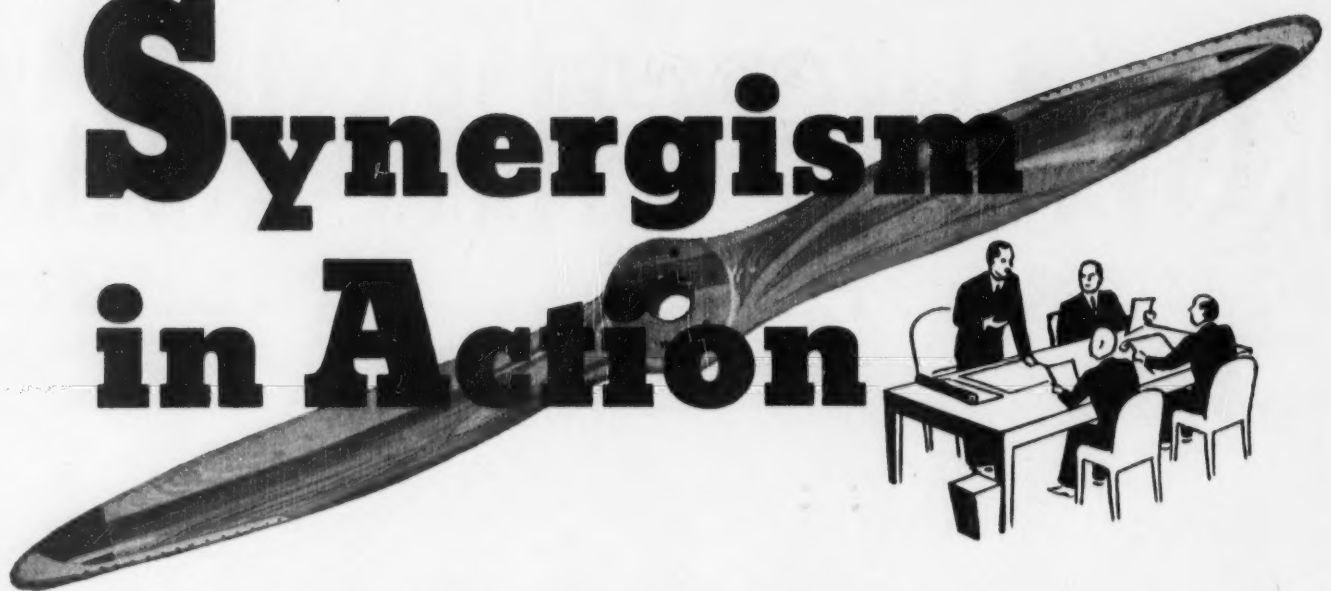
# ORGANIC FINISHING

SECTION OF METAL FINISHING



QUERING • ENAMELING • JAPANNING • PAINTING

# Synergism in Action



Synergism is new to industry, perhaps, but it is an old word that has acquired a vital new significance for today and the days ahead.

**SYNERGISM**, meaning forces working *together* to produce more than the sum of both working *separately*, can literally make  $2 + 2$  equal 5. True 2 apples plus 2 apples do not make 5 apples but an apple grower plus a chemist may make possible many more apples from the same trees and land.

In creating new products, in extending use for

old ones, there is profound need for synergism, and lots of it. When creative energy stimulates action by another—minds click—greater new ideas are born beyond expectations.

At Zapon we are working synergistically among ourselves and are anxious to so work with other companies. It has produced results. Let's talk it over.

## Synergism in an Airplane Propeller Finish

Wood of course is satisfactory for airplane propellers but finish of the surface is all important. Not only must the finish be tough to resist dust and the elements, it must prevent moisture absorption under sudden and widely varying temperatures and pressures—since a plane in a few minutes can soar from hot, humid sea level to cold, dry air two miles up. The finish must also control inside moisture content of the wood. It must fit fast production schedules.

Zapon SX-35 Finish was developed to meet

these requirements through consultation with propeller manufacturers. True synergistic thinking and study solved this major problem. We are not propeller manufacturers—propeller manufacturers are not finish manufacturers, but the right attitude of both put synergism to work, with profitable results. Nor is the effect limited to the needs of a war emergency, for the same process that created the propeller finish offers much for finishing new products when peace comes.



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Section of  
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# ORGANIC FINISHING

SECTION OF METAL FINISHING

MAY, 1943

## CONTENTS

+

Blushing of Lacquers — By  
Peter B. Torrance ..... 314

The Care and Conservation  
of Brushes ..... 318

Agitation of Finishing Ma-  
terials—By John E. Hyler 323

New Mill Treated Rust Re-  
sistant Sheets and Strip .. 327

+

This is Washington ..... 313

Manufacturers' Literature .. 328

Shop Problem ..... 330

New Equipment and  
Supplies ..... 331

Patents ..... 333

Business Items ..... 334

### Picture on the Cover

Freshly lacquered bombs are shown marching between banks of infra-red drying lamps in the finishing department of a large western munitions manufacturer.—*Press Assoc., Inc.*

## Blushing

Blushing or blooming is a condition with which everyone in the finishing industry comes in contact sooner or later. It is easily recognized in clear lacquers as a clouding of the film and in pigmented lacquers or enamels as a graying or loss of gloss. The important thing to remember is that it is caused by water which, under certain conditions of temperature and humidity, condenses from the air on the drying lacquer film and produces an incompatibility. If the blushing which results from this moisture is not severe, that is, if it disappears in a reasonably short length of time, probably no harm is done. On the other hand, if the clouding or loss of gloss mentioned persists, there is a good chance that the film has been adversely affected.

This summer every care must be taken to prevent blushing. Not only would work spoiled by blushing mean a loss of materials but, more important, work finished with lacquer films which might not stand up must not be allowed to leave the finishing room, particularly if it is work at all closely connected with the war effort.

We are, therefore, presenting a discussion on blushing in this issue of the Organic Finishing Section. The time of year when blushing occurs is approaching. It is our thought that such an article will be of interest at this time not only to experienced finishers who would like to brush up but, more important, to the newer men in the finishing industry who are handling lacquer type finishing materials for the first time.





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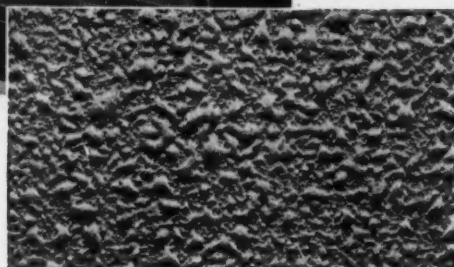
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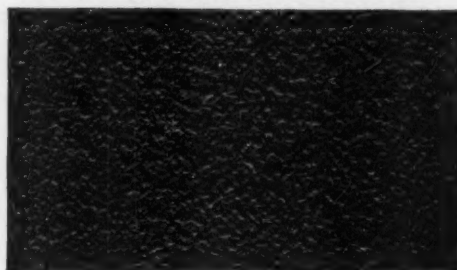
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# EGYPTIAN

*Superior* FINISHES



Here are shown actual photographs (unretouched) of panels finished with PEBBLE-TEX. Above shows coarse texture.



This panel shows a finer texture. The size of the pattern is regulated by spray gun adjustment and application technique.

# THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING'S Washington Correspondent

**Casein Under Allocation Control** Industrial casein, which is used in the making of certain paints, was placed under allocation control by General Preference Order M-307, issued on April 15, 1943. In making application for use of casein, five copies of form PD-600 and four copies of PD-601 must be prepared. Three copies of each form must be sent to WPB Chemical Division.

**Castor Oil Order** To conserve imported castor oil, an essential paint, varnish, and synthetic resin material, it was placed under complete allocation control of the Food Distribution Administration by FDA Order 32, issued on March 22, 1943. The principal change in this new order over WPB Order M-235, which it replaces, is that it requires industrial consumers to obtain specific authorization from month to month for the acceptance of delivery or use of castor oil.

**Chemical Salvage Program Extended** The Industrial Salvage Branch of the Salvage Division of the WPB has extended its chemical reclamation program. It is studying ways and means to conserve carbon tetrachloride, trichlorethylene and ethylene dichloride which are used in dipping, vapor degreasing, pressure and other cleaning operations to prevent wastage of naphtha, thinners, solvents and alcohols which are used in the manufacture of paints, lacquers and varnishes, and to save toluene, benzol, ethyl alcohol and butyl alcohol. For example, in the field of paints and lacquers, it claims that sludge from spray booths, properly processed and reused, will extend the usage of such critical materials as glycerine, phthalic anhydride and phenol.

**Congo Gum Imports Urged** Wells Martin, Deputy Chief, Protective Coatings and Materials Section of the WPB's Chemical Division, at a meeting of the Natural Resins Industry Advisory Committee held in Washington during the first week of April, urged the industry to take advantage of present shipping accommodations in the importation of Belgium Congo gum copal. He told the committee that because of the increasing difficulty in obtaining synthetic resins, it will be necessary to substitute Congo gum copal for many uses. Manufacturers of protective coatings were asked to conduct experimental work in the production of straight Congo varnishes and in the production of a blended product of Congo gum copal with alkyd resins.

**CMP Plan Check-up** To enforce the Controlled Materials Plan, the WPB will employ 1,200 agents to check on between 5,000 and 10,000 users of controlled materials. Most of these investigators are being borrowed from the Federal Trade Commission, the Federal Security Agency, the Wage and Hour Division of the Department of Labor, and other government agencies. W. John Logan, head of the WPB's CMP Compliance Division stated that "the investigation will be thorough. Compliance with the CMP regulations is of vital importance to war production, and willful violators will be treated accordingly." That means that the WPB intends to use full authority provided in the Federal Criminal Code.

**Degreasing and Metal Cleaning Equipment Prices** The OPA has provided manufacturers of steam cleaning equipment, degreasing machines, and metal washing and cleaning equipment with a more suitable pricing formula through the issuance on April 7, 1943 of Amendment No. 77 to Maximum Price Regulation No. 136, as amended. The new pricing formula has now brought the manufacturers of such equipment under the March 1942 base-date classification.

**Canadian Industrial Alcohol** The 13 companies engaged in the production of industrial alcohol from wheat in Canada will require 7,000,000 bushels of wheat to attain their 1943 goal of 14,000,000 gallons of industrial alcohol.

**Lead Pigments Committee Appointed** On April 7, 1943 the WPB appointed to the newly organized Lead Pigments Industry Advisory Committee Wells Martin of the WPB; S. B. Coolidge, Jr. of Sherwin-Williams Co., Cleveland; F. H. Hurless of the International Smelting & Refining Co., East Chicago; John R. MacGregor of John R. MacGregor Lead Co., Chicago; H. Rowe of the National Lead Co., New York City; P. E. Sprague of the Glidden Co., Cleveland; W. Wilke, Jr. of the Hammond Lead Products Co. of Hammond, Ind.; and Miles M. Zoller of the Eagle Pitcher Lead Co., Cincinnati.

**Linseed Oil Shortage** At the March 25, 1943 meeting of the Paint, Varnish and Lacquer Industry Advisory Committee, the members were told that existing inventories of drying oils are growing critical. In fact they were warned that linseed oil supplies for protective coatings are not ample. Present linseed oil quotas may have to be reduced.

**Marine Paint Inventory Eased** In the issuance of Preference Rating Order P-65, as amended April 10, 1943, manufacturers of marine paints (for the coating of bottoms, gear, tackle, fittings and other necessary accessories and parts), may now build up their inventories to meet the repair demands of ships owned and operated by the Army, Navy, Maritime Commission and War Shipping Administration. This amended order has raised the rating from A-3 to AA-1 for deliveries to producers by their suppliers of the materials needed in making marine paints for the war agencies.

**Order M-258 Administered by PAW** The administration of General Preference Mineral Oil Polymers Order M-258, as amended March 27, 1943, (an order which includes mineral oil for protective coatings), has been transferred from the WPB's Chemical Division to the Office of the Petroleum Administrator. This amended order authorizes PAW to "take any action with respect to this Order, or with respect to any person affected by this Order, which may be taken by the Director General for Operations" of the WPB.

**Steel Shipping Drums Restricted** Those members of the metal finishing industry who use steel shipping drums are prohibited from selling, delivering, or using new steel shipping drums and parts without specific authorization from the WPB according to General Preference Order M-255, as amended March 29, 1943. Applications for selling, delivering or using such drums should be made on Form PD-835 and addressed to the Container Division of the WPB.

**Tung Oil Order** War Production Board Order M-57, which deals with domestically produced and imported tung oil, was replaced by Food Distribution Order 39 on March 22, 1943 when the allocation control of this commodity passed into the hands of the Director of Food Distribution. The WPB order did not require an authorization order for the delivery of 35 pounds or less of tung oil per month. The new order exempts persons using 40 pounds or less per month, but specific authorization for the making of small amounts must be obtained from the Director of Food Distribution by making application on WPB Form PD-600.

# Blushing of Lacquers

By PETER B. TORRANCE

WITH the approach of warmer and more humid weather, encounters with the time-honored annoyance of blushing of cellulose finishing materials, such as lacquers and dopes, may be expected. Known in the early days of lacquer finishing as "blooming," this undesirable occurrence in the drying of a lacquer film normally manifests itself by a clouding or milky opacity of clear films and by a whitening, graying, or irregular iridescent loss of lustre on the surface of enamels. Blushing will appear within a few minutes after the application of the lacquer and, if not severe, may disappear entirely when the film is dry. If sufficiently severe to persist in the dry film, it will not only detract from the appearance of the finish but may impair its physical properties.

Blushing indicates that one or more of the ingredients of the film forming agent have been precipitated out of solution while the film was still wet. In the case of a lacquer, a partial precipitation of the resinous element, resulting usually in a grayish partial opacity of the film or in the presence of many microscopic gray specks, is known as a "gum blush." The lack of adequate distribution of hydrocarbon solvent to retain complete solution of the resin until the film is set is the cause of gum blush and the correction lies in the addition of more or richer suitable solvent. "Cotton blush" is a very similar condition in appearance and results from a parallel cause—poor solvent balance or a generally "lean" solvent mixture.

Fortunately the two above types of blushing are seldom encountered with modern materials. They are the result of relatively unstable, poorly formulated materials or the use of a "cheap" economy thinner containing a high percentage of diluent. With the use of modern solvents such examples of poorly balanced solvency are rarely encountered, but it is entirely possible that the increasing use of substitute materials for those restricted by the war effort may occasion some return of a partial precipitation of ingredients under certain conditions. Such a condition might be in extreme chilling of the material by storage in unheated surroundings in freezing weather or might lie in the thinning method. In thinning, especially with low-cost thinners, addition of the lacquer suddenly to a mass of the thinner, instead of the reverse practice of adding the thinner to the lacquer, will sometimes result in a distinct "kicking out" of the solid ingredients. Complete solvency will return in a short time under thorough agitation although, if an excess of low-solvency thinner has been so added, the precipitation tendency may be carried into the wet film as a grayness or "blush."

The third, more common, and constantly recurring form

of blush is that known as "solvent blush" in which the low temperatures near the surface of the drying film occasioned by rapid evaporation of highly volatile solvents cause condensation of free water from a highly humid atmosphere which in turn, not being miscible with lacquer constituents, induces a precipitation of the solid ingredients in the wet film. The extent of this cooling tendency from rapid evaporation is surprising and can be demonstrated readily if a thin metal panel, especially one of brass or similar heat conducting metal, is coated on one side with a wet coat of lacquer, or even of thinner, and is held in the hand. The metal will become very cold in a few seconds and remain so until the wet material on the surface has flashed off. This same principle is involved in the operation of the olla, or earthen water jar, of sub-tropical countries which are kept cool in the very warm climate by the constant evaporation of moisture from the surface of the porous walls.

## Humidity and Its Measurement

The tendency of the occurrence of solvent blushing is commonly said to be due to the humidity which may, in turn, be defined as the amount of moisture held in the air. There are two distinct definitions or conditions of humidity both of which refer to the amount of moisture in the atmosphere. Absolute humidity is the actual amount of water per unit of weight or volume of air, such as grains per cubic foot or grams per pound of air, which is being retained in the air. Since the capacity of the air for the retention of water is governed by temperature, there is a point at which moisture cannot be retained but will be condensed into visible drops and which is known as the dew point. An illustrative example of the operation of the dew point may be seen in the "sweating" of the sides of a glass of ice water on a warm day. The cold glass surface chills the adjacent air to an extent that causes it to release moisture, being held in suspension, on the surface of the glass.

Since this capacity of air for the retention of water is dependent on temperature, the absolute humidity does not reveal the proximity of condensation and is consequently of little value in determining the danger point in lacquer blush tendency. The more common term of expression therefore, is that of "relative humidity" which is merely the amount of water retained by the air in proportion to the amount it could hold if it were completely saturated.

There is no set rule for the maintenance of conditions in the lacquer room for the prevention of blushing, as the point at which blushing may be expected to begin will vary considerably with the particular formulation of the lacquer



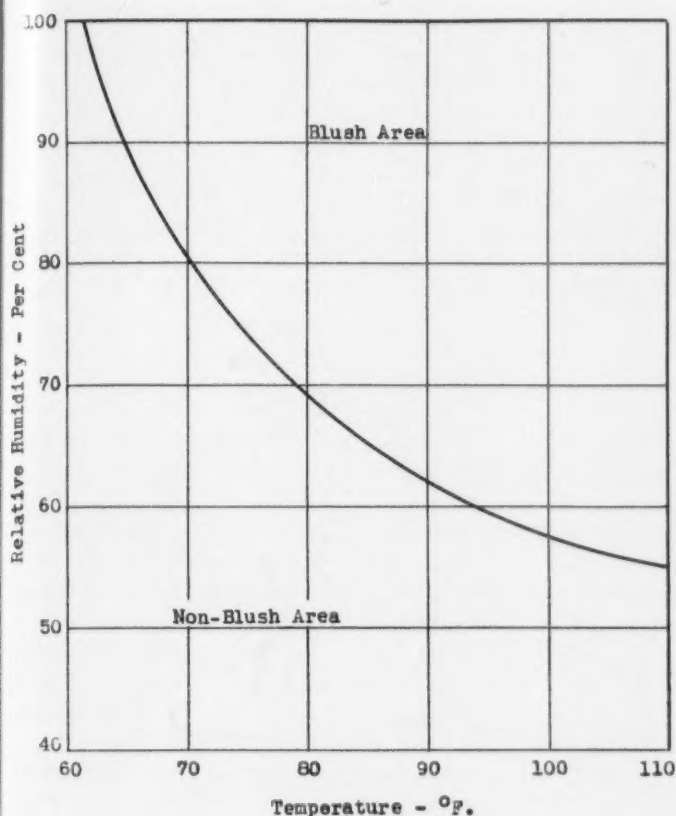


Fig. 1—Blush Chart

being used and possibly to an equal extent, with local conditions. Generally speaking, blushing may be expected in summer weather when the relative humidity rises above 50 per cent which is the point recommended as a healthful condition in homes and work rooms. Due to this variable tendency, no generally adaptable tabulation of blush hazard can be made by which the finisher can be guided and forewarned. It is, however, a relatively simple matter to establish the minimum blush point for the particular lacquer in use and to determine accurately, before starting work, whether or not the lacquer will blush.

Measurement of the relative humidity in a work room preparatory to the spraying of lacquer is a quick and simple determination. Relative humidity is measured with some form of a hygrometer (not to be confused with the hydrometer which is an instrument for measuring the density of liquids) which is merely a double thermometer with one unit recording the temperature of the normal atmosphere and the other giving the "wet bulb" reading or the temperature at saturation, which is accomplished by having the bulb surrounded by a wick saturated with water.

The common hygrometer, consisting of the two thermometer tubes mounted on a back or base with a water reservoir and wick from the wet bulb, is an entirely practical instrument if adequate provision is made for a free, rapid circulation of air past the bulbs in order that a representative reading of the atmosphere of the room may be obtained. If the instrument is merely hung on the wall and read casually, like an ordinary thermometer, the results will vary widely in accuracy. If the instrument is fanned vigorously for a few minutes, or set in the path of a small electric fan, an accurate determination will be obtained.

A more practical and accurate instrument is the sling

psychrometer which is a double thermometer or hygrometer with a swivel handle at one end which permits the entire instrument to be whirled rapidly causing a high velocity passage of air past the bulbs on the free end.

An even more accurate instrument is the aspiration psychrometer in which the thermal tubes are surrounded by a highly polished tube so that they are not affected by radiation of surrounding objects and with a small clock-work driven fan which forces a constant and uniform blast of air through the outer tube past the bulbs. This, however, is a more complicated and expensive instrument and one of a technical accuracy not usually demanded by finishing room requirements.

The actual determination of the relative humidity value from the psychrometer or hygrometer is not infrequently misunderstood, and the temperature reading of the wet bulb is sometimes accepted as the relative humidity. Actually the relative humidity, as the name implies, is found in the *ratio* or relationship between the dry bulb temperature and the wet bulb temperature.

The relative humidity, as determined by these two known factors, is reached by a relatively complicated formula which it is not necessary to apply in everyday practice. Charts or tables of relative humidity based on the dry bulb temperature and the difference between the wet and dry bulb temperatures are readily available and form a ready reference for the humidity determination. The difference between the bulb readings tells the story and the less the difference between the wet and dry bulbs, the greater the relative humidity. Obviously, if the two bulbs read the same, the humidity is 100% (See Fig. II, next page).

Daily readings, or better still, several readings a day in the lacquer room with a sling psychrometer—and it takes only a couple of minutes to take such a reading—will, if faithfully recorded along with a notation on the current behavior of the lacquer films, soon form an experience table which will permit the plotting of a comprehensive table of blush probabilities of the particular lacquer being used. The supplier of the lacquer, if he has access to a humidity controlled atmosphere, can supply a graphic chart showing exactly when his material may be expected to show blush tendencies, but the above method of preparing one from an actual experience table is even more applicable.

The accompanying chart, Figure I, compiled in the above described manner, shows the appearance of a "blush curve" for an actual lacquer of relatively high blush resistance. This is, of course, displayed merely as a representative curve and is applicable only to the particular material from which it was made. In using this particular lacquer therefore, we have but to take a psychrometer reading in the room in which it is to be used. If the lines from the respective relative humidity and dry bulb readings intersect at a point within the shaded area, we are assured by our experience in compiling the chart that blushing will occur and steps must be taken for its prevention.

#### Prevention of Blushing

The prevention of blushing consists of combating the combined effect of the rapid drying of the lacquer in an atmosphere carrying too high a percentage of moisture. The procedure may take one of two courses: that of altering the condition of the atmosphere or the drying time of the lacquer, or both.

From our above discussion of the nature and behavior of atmospheric moisture, it may be seen that by increasing the temperature of the air, we increase its capacity for moisture, lower the "relative" humidity, and make the moisture more stable. For this reason, high humidity is often combated by the simple expedient of turning on the heat in the room. This is usually effective but not conducive to the comfort of the working personnel in warm weather. It may have the further disadvantage of increasing the drying rate of the lacquer, resulting in poor flow and excessive overspray.

Apart from the above method of lowering the relative humidity by increasing the temperature, it is possible sometimes to produce a similar effect by lowering the *absolute* humidity—the actual amount of moisture held in atmospheric suspension—by circulating the air of the room through condensers to condense out some of the water in the air. In a large room, however, this procedure will require an amount of equipment and installation approaching actual air conditioning which is, although the ideal arrangement, quite expensive.

In common practice, the usual procedure in combating blushing lies in the extension of the drying time of the lacquer by the addition of a "retarder," a very slow evaporating thinner or solvent which, as the name implies, "retards" the drying rate.

A logical question at this point might be the query as to why, if it is so simple a matter to slow up the drying of the lacquer to prevent blushing, the lacquer is not made with the inclusion of sufficient slow solvent in the first place so that it will not blush. There are several reasons. There are many lacquers, of course, which contain a sufficiently high percentage of high boiling solvent to prevent blushing under any normal atmospheric condition. Such retarding elements, however, being active solvents for the solid constituents of the film forming material, tend to lower the viscosity rapidly, making the lacquer not only more slow drying, but less viscous and with an increased tendency to "run" on heavy application. These rich solvents also are expensive and, if kept at hand in the form of an emergency retarder, need not affect the cost of the material at times when this unusually high resistance to blushing is not required.

The amount of retarder necessary to prevent blushing

will depend upon the intensity of the blushing tendency and the original solvent formulation of the lacquer and can be determined only by experience. The manufacturer of the lacquer can usually make a fairly specific recommendation, but the most satisfactory information is derived from actual trial and error under the particular existing local conditions.

Since the solvent element of a lacquer is rather carefully balanced with regard to the character of the film to be laid down, the drying time, the viscosity, workability and cost factor, the addition of any considerable amount of rich solvent as typified by an effective blush retarder will, of necessity, disturb the balance of the formulation.

No dire effect may be expected from this addition other than those of slightly greater fluidity, or tendency to run, and increased cost. Generally speaking, it should not be necessary to add more than 5 to 10 per cent by volume of retarder to a well balanced lacquer to control solvent blushing.

Control of the approaches to a blushing condition which lie in the physical environment of the coating operation will not lie in the manipulation of any single factor. As is the case in so many finishing application problems, the control will be in the balance of safety attained by the thoughtful attention to each of a number of contributory elements.

Drafts from open windows, open elevator shafts or an over-zealous exhaust system will, by hastening surface drying, tend to invite blushing as well as other troubles.

An excess of moisture in compressed air for spraying—while usually manifesting itself in the form of globular blisters or circular craters in a finish film—can, if well atomized, actually contribute to blushing. The most logical precaution against compressed air moisture is in the use of a cold water condenser unit in the air line, in addition to the normal filters. This arrangement will automatically remove an excess of free moisture.

On lacquered work to be re-coated with a similar material, a moderate amount of blush on the first coat is of no consequence if reasonable precaution has been taken to avoid its recurrence in the final, or finish coats. In the event of a moderate or localized blush area on a large piece, blush can be dispelled easily by spraying over the surface with a thinner of sufficient richness to re-dissolve the precipitation in the film and prevent its reformation.

TABLE FOR DETERMINING RELATIVE HUMIDITY

Difference °F. Wet-Bulb and Dry-Bulb Temperatures

Dry-Bulb Temperature—°F.	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°
80°	96	91	87	83	79	75	72	68	64	61	57	54	50	47	44	41	38	35
82°	96	92	88	84	80	76	72	69	65	61	58	55	51	48	45	42	39	36
84°	96	92	88	84	80	76	73	69	66	62	59	56	52	49	46	43	40	37
86°	96	92	88	84	81	77	73	70	66	63	60	57	53	50	47	44	42	39
88°	96	92	88	85	81	77	74	70	67	64	61	57	54	51	48	46	43	40
90°	96	92	89	85	81	78	74	71	68	65	61	58	55	52	49	47	44	41
92°	96	92	89	85	82	78	75	72	68	65	62	59	56	53	50	48	45	42
94°	96	93	89	85	82	79	75	72	69	66	63	60	57	54	51	49	46	43
96°	96	93	89	86	82	79	76	73	69	66	63	61	58	55	52	50	47	44
98°	96	93	89	86	82	79	76	73	70	67	64	61	58	55	53	50	48	45

Figure 11





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# The Care and Conservation of Brushes

Because supplies of bristles for paint, varnish and lacquer brushes are limited, brushes are being made of fifty-five per cent bristle and forty-five per cent horsehair or other substitutes. It is necessary, therefore, that these brushes be properly used and cared for in order that they may give as much service as possible. This article contains detailed information on the handling of brushes such as breaking in, maintenance and reconditioning. It will be found to be of great interest to those who are applying finishing materials by brushing.—Ed.

Many hundreds of thousands of paint brushes are now needed to protect the surfaces of our battleships, cruisers, torpedo boats, tanks, and trucks. In fact, all equipment used by

our armed forces must have a protective coating against the elements, and this coating is often applied with paint brushes.

Brush materials come to us over sea lanes that stretch across the world—sea lanes now closed to all but the most essential war needs, so that conservation of brushes is particularly imperative at this time. We must save bristle, the rubber in brush settings, and the tin in the ferrules. This means that we must gather together all our old brushes and revitalize them, so that they will give us further service. It also means that our new brushes must be given the best possible care, because the brushes we buy today are by government order made with only 55 per cent bristle. The remainder is entirely horsehair or fibre. To get good performance from brushes of present day manufacture, proper care and handling are not only important; they are essential.

Brushes are made to apply paint, varnish, lacquer, kalsomine and other painting vehicles. They are made to perform even under severe usage and will last a long time if given the proper care. Oftentimes, however, they are abused and then, of course, their life is shortened, and their performance unsatisfactory.

Brushes are thoroughly cleaned before they leave the brush factory, but sometimes a few loose hairs remain in them, and these hairs should be removed before the brush is put into service. To remove loose hairs, hold the fingers of one hand rigid and, holding the brush in the other hand, run the bristle sharply across the fingers. This will cause the loose bristle

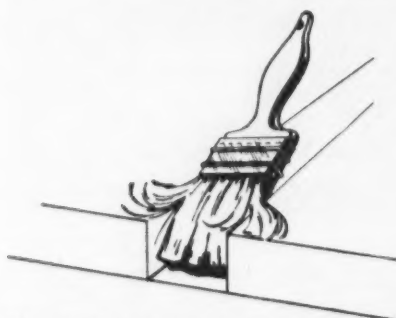


Fig. 1—Never pound, daub or force the brush into corners or other narrow places.



Fig. 2—Never use brush edgewise.



Fig. 3—Never submerge the entire length of the bristle into the paint.

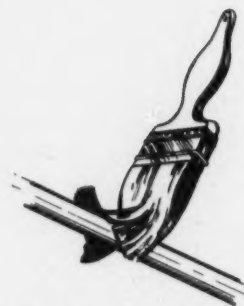


Fig. 4—Never use a large, flat brush when working on pipes or other round surfaces in this manner.

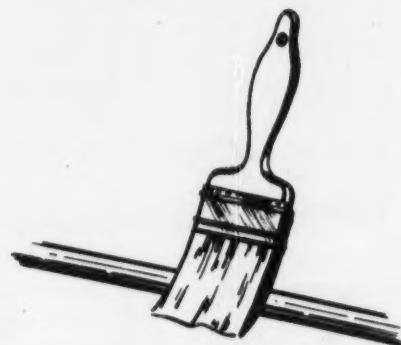


Fig. 5—When working on pipes or other round surfaces, use brush in this manner.

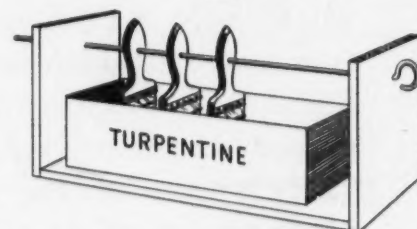


Fig. 6—Between jobs brushes should be kept in a brush keeper.

to work forward and extend, so that it may be removed easily. This operation will tangle the horsehair in the brush. Be sure therefore, to comb the brush straight before putting it into service. A steel comb is recommended for this purpose.

## Preparing the Brush for Service

It is wrong to take a new paint brush out of its wrapper and put it directly into the paint pot and work

(Printed by permission of The Osborn Mfg. Co., Cleveland, Ohio.)

with it. A new brush should always be broken in. The right way to prepare a brush is to immerse it in linseed oil at least twelve hours before it is to be used. Then apply a thin coating of linseed oil over the original wrapper or any heavy paper and rewrap the brush in the oiled paper, being careful not to disturb the shape of the brush. Set the brush on its flat side, or suspend it in a paint pot half filled with linseed oil. When ready to use the brush, remove all the surplus oil. There are many ways of doing this, but one widely used is to press a wooden strip heavily across the bristle, starting from the ferrule end and working downward to the tip of the brush, until most of the oil has been removed. Then whirl the brush between the palms of both hands in a container. This saves the oil and prevents it from spraying all over. After that, comb the bristle straight, and the brush is ready for service.

A new brush should always be dipped slowly and gradually into the paint until it has absorbed enough of the vehicle, and only then put to work. When a new paint brush is put into paint, the paint pigment adheres to the bristle and is difficult to remove. If a new brush is treated with oil before it is used, however, the paint pigment does not cling so tightly to the bristle, and is easier to clean out. A clean brush is essential to good workmanship; a clean brush is more pliable; a clean brush will do many more yards of painting surface, and will work more easily and efficiently.

While working, painters usually press their brushes across the rim of the paint pot to remove excess paint. This action of pressing a flat brush against the round rim bends the bristle at the corners of the brush and also results in an accumulation of paint under the rim of the pot. This accumulation congeals and often drops back into the paint. Every painter has had the unpleasant experience of fishing this mess out of the paint pot. This can be avoided by the use of a very simple device. Fit a wire ring around the paint pot close to the top, then fasten another piece of heavy wire about one-third across the mouth of the paint pot. By using this cross wire for removing excess paint, the brush will always be straight, and the wire can be easily removed, cleaned and replaced on the paint pot.

### Cautions

Do not force the brush into the paint pot at one time. All paint vehicles travel upward, and if the brush is completely immersed in the paint, not only does the paint cover the bristle, but it will soon travel all over the ferrule and handle, and the surplus paint will fill the hollow at the center of the brush and begin to accumulate at the heel, both inside and outside the brush—a bad practice with any brush.

Do not use a brush edgewise. This causes the bristle to finger and results in a poor paint job. It also causes the brush to wear off at the corners.

Do not press the brush hard against the surface to be painted. This method does not paint on paint, but rubs it on, which is a bad practice.

Do not paint with the whole brush. Paint with the flag end and about one-half of the length of the bristle only, plying the brush with a steady, even stroke. Using the whole brush or side swiping with the brush only tends to wear down the bristle at the sides and make the brush useless at the top. It is important to remember that today's brushes are made with only 55 per cent bristle content. About 20 of the 55 per cent comprises the outer layer or casing of the brush. The remaining 35 per cent is distributed throughout the center of the brush, and if the outer layer is worn down, a greater percentage of horsehair than bristle remains in the brush. For that reason it is imperative that we accustom ourselves to use paint brushes more carefully now than ever before.

Do not use a small brush while working on a large surface or a large brush while working on a small surface. For example, do not try to paint a sash with a 4" or 5" wall brush. This is a costly practice. Use a 1½" or 2" sash or varnish brush, which is built for the purpose.

Do not pound, daub, or force a brush into corners, small spaces or crevices difficult to get into. Use a small brush or an old brush for that purpose.

Do not use a new brush on rough surfaces for the first or even the second coat. Use a worn brush for the first coats, and a new brush for the final coat.

Do not use a large flat brush when working on a round surface or on

pipes. This causes the bristle to wear down at the center, and the brush will not give satisfactory results thereafter. Use a small size brush or an oval varnish brush, both of which styles are made for such jobs.

Many painters have the habit of putting a new brush in water before using it. Others put the brush in water after having used it in paint. Both these practices are wrong and result in poor performance and workmanship. Almost all paint products have an oil content, and *water and oil do not mix*. Water causes the brush to swell and tends to make bristle flabby and cause it to finger. When a brush which has been kept in water to retain its softness and pliability is again put into paint, several things happen. The paint pigment seals the moisture in the bristle and prevents it from evaporating or drying, thereby creating a conflict between the water and oil. The reaction is that the brush fingers and gives a streaky and unsatisfactory performance. This is more noticeable in present day brushes made with horsehair content.

### Maintenance

After a brush has been used all day the painter should remove all surplus paint and hang the brush in a container of linseed oil and turpentine, or in turpentine only if the brush has been used in varnish. Another method for keeping brushes fit is to remove all surplus paint pigment at the end of the working day, dip the brush in linseed oil, wrap it in heavy paper and set it away on its flat side. Or they may be placed in professional brush keepers which have special holders on which the brushes can be inserted and held firmly suspended in the proper position. When brushes are taken from the container all surplus oil should be removed before they are put to work.

Do not at any time rest a brush on the bristle. The heavy paint pigment causes the bristle to slide toward one end, and oftentimes even bends the flat side of the brush, making it useless for further satisfactory service. If a brush is to be placed in the paint pot, it should be properly suspended so that the bristle does not touch the bottom of the pot. To do this, bore a small hole through the center of the handle, insert a strong wire through the hole, and lay the wire across the



rim of the container so that the brush is held securely.

If a brush is to be stored away for any length of time, it is important that all the paint be thoroughly removed from it, first by washing the brush in turpentine or a liquid cleaner; then in soap and water, after which it should be dried thoroughly. This may take from two to three days. After the bristle has dried, immerse it in linseed oil, wrap it in paper, making certain that the bristle is straight before it is placed in the wrapper. It is a good practice, when a brush has been stored away and will not be used for some time, to occasionally remove the wrapper and apply a fresh coating of oil to it, then replace it on the brush.

### Reconditioning Brushes

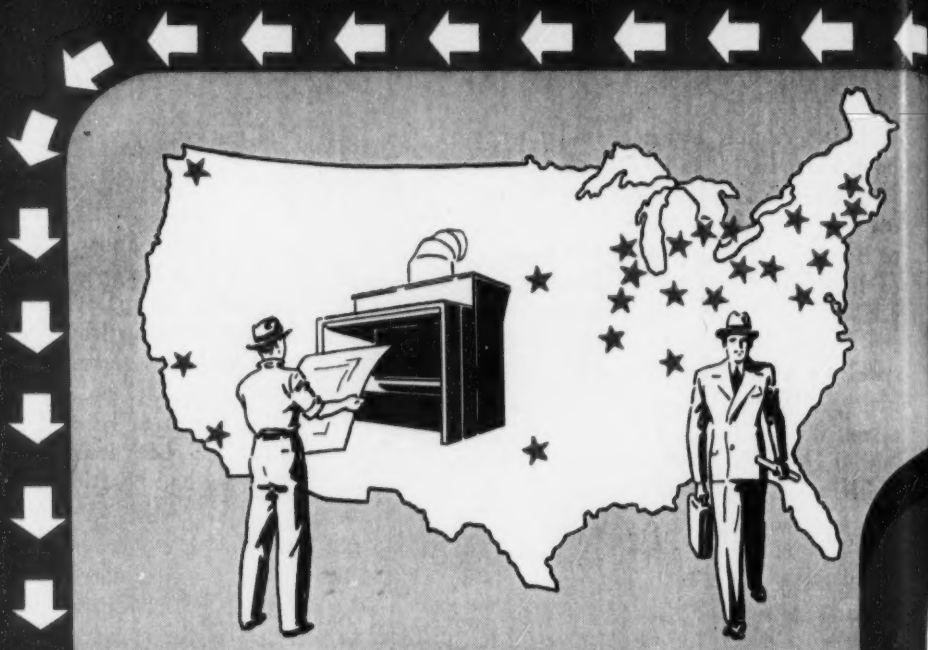
Discarded brushes, no matter how old they may be, can be washed and revitalized for further use. Brushes having a length of three to three and one-quarter inches or over can be reconditioned so that they will paint thousands more feet of surface by using the following method:

(When bristle in brushes has hardened, do not attempt to paint with them. Remove the hardened paint accumulation before trying to use your brushes.)

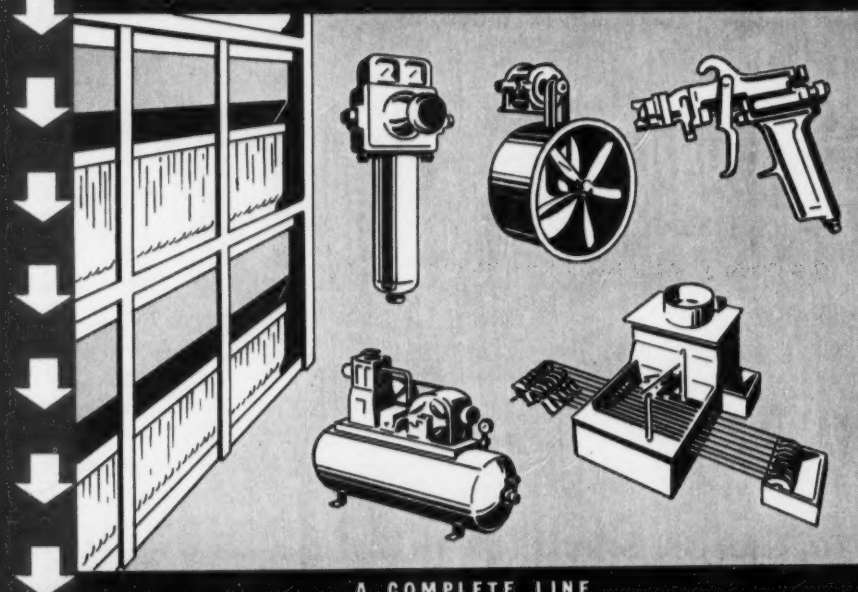
To clean hardened brushes, place them in a pot or tray and pour liquid brush cleaner or turpentine over them. Let them soak until the bristle has softened. This sometimes takes as much as 24-48 hours, depending on how hard the paint is. From time to time during this softening process, work the bristle with the fingers to loosen the paint accumulation. Use a scraper for removing the paint, working it from the heel of the brush to the tip.

Then place the brushes in a pail filled with hot water and soap powder. The water should be hot, but at a temperature which will permit the operator to place his hands into it without danger of being burned. For this soaking process use about one-quarter pound of soap powder to one gallon of water.

Next comes the actual washing operation, which is done on an old-fashioned washboard placed in a tub. Sprinkle some soap powder on the washboard, and holding the brush firmly by the handle with the narrow side toward the operator, rub it across the washboard using the same motion



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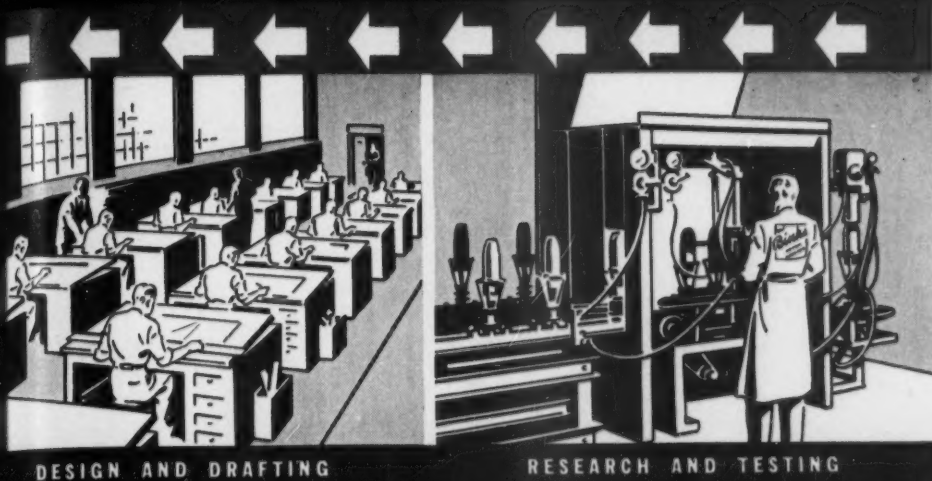
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as is used in washing clothes. First rub the brush at both corners to loosen the bristle at those points. After the paint has been loosened at the corners, place the brush with the bristle part flat on the washboard, and with the other hand pressing down firmly on the bristle, continue the rubbing motion. Then reverse the brush and repeat the rubbing process, from time to time dipping the brush into the hot water and sprinkling fresh soap powder on the board. Continue the rubbing operation until the bristle is clean, then rinse the brush in cold

water until all traces of paint and soap have been removed from the bristle, and the rinse water remains clear. (If the bristle is stubbornly hard it is advisable to sprinkle some fine sand on the washboard with the soap powder during the rubbing operation, as this will help loosen the paint more rapidly and hasten the cleaning process.)

After the brush has been washed, comb the bristle straight with a steel comb, wrap the brush in heavy wrapping paper and set it away to dry thoroughly. When the brush has dried,





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dip it in linseed oil, rewrap it in an oil-coated wrapper and put it away until it is needed again.

### Cleaning Brushes

Brushes used to apply paint, enamel or varnish should be cleaned in turpentine. Those used for alcohol stain or shellac should be cleaned in alcohol. If a brush has been used in lacquer, it should be cleaned with lacquer thinner, preferably a thinner made by the same manufacturer who made the lacquer.

Never wash or keep a brush in ker-

osene. If a brush has been washed or kept in kerosene, do not put it into service again until all traces of the kerosene have been removed, by washing and cleaning the brush in turpentine. Kerosene slows up the drying of paint, sometimes for as much as several days. The painter may not know the reason for the slow drying and blame the paint or the surface painted, but if the brush has been cleaned in kerosene it is the kerosene in the bristle which is at fault. The safest way to avoid this condition is never to use kerosene in cleaning or

caring for brushes. Gasoline used on brushes acts in the same manner as kerosene.

Brushes used in water paints, kalsomine, whitewash or casein paints present a special problem. They must be washed out immediately after each using. Leaving a brush filled with these pigments is a common practice and causes the bristle to rot and break. Sometimes a brush is allowed to set in the paint pot or laid across the rim of the pot for hours at a time, while the painter goes on to other work. This is an extremely bad practice. As soon as you have finished with a brush used in these materials, wash it out. To set it aside for even a short time may harm the bristle. If a brush used in these vehicles is not to be used for the remainder of the day, wash it out thoroughly in plain cold water, rinse it clean, then dip it into vinegar or a solution of vinegar and water, comb the bristle straight and hang the brush up by the handle, so that the bristle flag does not touch against anything. If the brush is not to be used for some time, however, wash it out in a solution of soap and warm water, dip it into vinegar or a mixture of vinegar and water, comb the bristle straight, and hang it away to dry. It is imperative that brushes used in any of these vehicles be kept thoroughly clean, particularly at the heel which is the danger line. Once any of these materials attacks the bristle, it is sure to break off. Use a scraper or blunt pointed tool to get into the heel of the brush to remove any accumulated pigment. When brushes are used in water paints, it is advisable to use alternate brushes daily, so that they are thoroughly dry before they are used again.

### Wartime Brushes

Whenever the adulterants of horse-hair and fibre, as required by the emergency program, are used in a brush, its efficiency is immediately reduced. Mixed brushes cannot possibly give the same satisfaction as pure bristle brushes, but we must conserve bristle, rubber and steel for our war needs. However, we must also preserve our properties for the duration and it is our patriotic duty to keep our homes, equipment and vehicles painted for protection against the elements. Therefore, old and discarded brushes can and should be utilized wherever possible for that purpose. Keep your

(Concluded on page 325)



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# Agitation of Finishing Materials

By JOHN E. HYLER

Peoria, Illinois

**T**HERE are two aspects of agitating finishing materials, one of which is covered by the word "mixing," that is, dispersing the pigments or solids uniformly through the material in order that it may be readily and uniformly applied; the other aspect is simply the continuance of such agitation after the material has been thoroughly mixed, in order to keep it in that condition while it is being applied to the work.

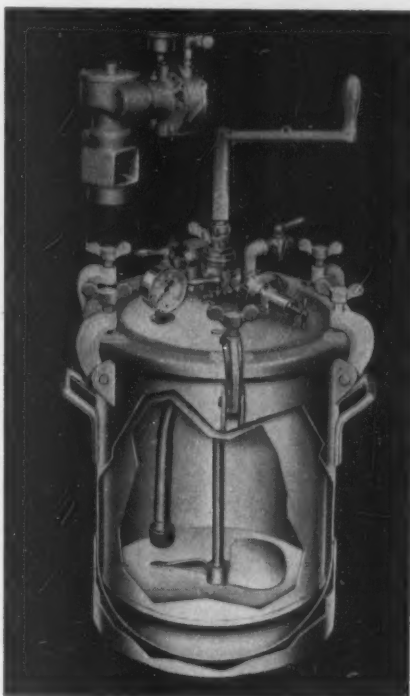
In any kind of agitation or mixing of finishing materials, care must be used not to centrifuge the liquid, for this will throw the pigments or heavier portions to the outside and thereby separate rather than mix. Large rotary paddles in round or cylindrical tanks are therefore to be avoided, and it will be noticed that none of the different types of mixing equipment discussed below incorporate such a setup.

## Air Agitation

It is interesting to know that in some cases the direct application of forced air has been used to keep materials intimately mixed by keeping them in a state of turbulence. Air introduced into the bottom of a tank or drum will find its way to the top and out in the form of bubbles, and will direct the pigment upward with it, contrary to the natural gravitational trend, thus keeping it mixed. One of the large blower fan manufacturers has cited his fans for the agitation and aeration of liquids. Compressed air is readily available in most finishing departments, since it is needed for spraying and other duties. If you have a drum or barrel of finishing material which requires mixing, bring a lead from the air line and attach to it a length of pipe that can be placed through the bung hole of the barrel or drum, with the end of the pipe at the bottom. Then, by means of a valve, release a continual flow of air through the pipe to the bottom of the drum at whatever velocity may be needed, as determined by experiment, to keep the material properly mixed and agitated. It should

Most finishing materials require mixing before they are used and agitation during use to keep them uniform. Otherwise, finish troubles such as poor adhesion, off-color, etc., may occur. The author reviews and describes the various methods for mixing and agitating finishing materials. The advantages and special features of air-driven agitators, portable mixers, etc. are discussed.—Ed.

be remembered, however, that this method of agitation may cause thickening of the finishing material.



Paint feed tank equipped with agitator. Insert shows air driven motor.

## Circulatory Agitation

There are instances where some form of dip finishing or flow coating application is involved, where the finishing material in actual use is more or less openly exposed to settling dirt and foreign matter. In such cases it has been found expedient to combine a straining operation with agitation of the material. As supplied by one firm, this involves equipment for pumping the finishing material from the dip tank or other container where it is used, forcing it through a strainer and thence back into the dip tank or flow

coating device. Actually, the agitation of the material in this case might be regarded as a secondary function of the straining operation, but it is none the less effective. The cycle being continuous, the agitation is going on all the time, and in most cases where such a layout is used all of the finishing material in the tank passes through the strainer a number of times each hour. Streaked finishes are minimized where such equipment is on the job.

## Portable Mixers

However, there are various instances where open tanks and containers are well enough protected so that a continuous straining device is not necessary, though it is essential that mixing action be maintained. For such tanks, there are portable mixers. One line of these has clamps attached by means of which the mixer may be clamped directly to the side of a tank at any point, there being an extended propeller shaft carrying two propeller blades at different points on the extended shaft to do the mixing. These mixers are connected to the clamp mentioned by a swivel joint so that the propeller shaft may be positioned as one pleases. This helps to adapt the device to different sizes and shapes of tanks. Such mixers are available in a considerable range of sizes.

Another firm making a similar line of portable mixers of the clamp-on type provides them with variable speed drive when that is desired. These are especially good for experimental work, although there are other cases where the ability to adjust the speed of a mixer is convenient. Still another firm making portable, extended-shaft, propeller type mixers, has incorporated a special provision which results in highly efficient mixing. Two propellers having opposite mixing actions are mounted on the same shaft. The propeller at the lower end of the shaft on these machines is a lifting or "pull-up" propeller, directing the material in a current upward from the (Illustrations by courtesy of The DeVilbiss Co., and International Engineering, Inc.)



bottom of the tank, while the propeller farther up the shaft is of "push-down" type, inducing a current downward. There is turbulence and plenty of mixing action in both, which is still further enhanced where the two currents meet in opposition to one another.

One company which furnishes all types of portable mixers, also provides stationary agitators of many types, ranging from  $\frac{1}{4}$  h. p. all the way up to 50 h. p. Many of these are so-called top-entering mixers with a vertical propeller-mixer shaft, and with the motor directly mounted on the top end of the mixer shaft. For the most part, such mixers have had their speed limited to the speed of the driving motor, but there have been recent improvements in this respect. One outstanding builder of agitating equipment has provided a top-entering mixer so arranged that the driving motor is out at the side of the propeller-mixer shaft, and is vee-belted thereto. This setup allows the speed of the shaft to be regulated to whatever point may be desirable for any given setup, simply by using different sizes of pulleys. Mixers of this kind may be had for use over either open or closed tanks.

The same firm which provided this improvement in stationary top-entering mixers has also produced a line of air-driven portable mixers which are especially adapted for use in paint mixing. Some of these are direct air drive, while others are gear reduction types. The air motors on these units cannot be overloaded or burned out, will not stall, and the air exhaust is so arranged as to keep them running cool at all times.

#### Air Operated Agitators

Not only does an air-motored mixer run cool, but it cannot throw any



Electric Portable Mixer

sparks, for which reason it is regarded as especially safe for mixing finishing materials that are of a particularly inflammable or explosive nature. One of the manufacturers of spray guns has developed and put on the market an air-motored finishing materials agitator which can be used on batches of material of all sizes up to 100 gallons. Since the speed of this mixer can be governed by the air intake on the motor, it may be operated at any desired speed between 30 r. p. m. and 6,000 r. p. m. This mixer, like one of the others mentioned in this article, has two propellers mounted on the same shaft, arranged to "throw" the top and bottom of the finishing material together. In addition to the more thorough mixing cited, this provision obviates any chance of the material splashing, since the topmost propeller throws downward.

Rotary air motors for finishing materials mixing are available as separate units. At least one firm supplies them, fitted with ball bearings, and capable of delivering from  $\frac{1}{20}$  to 1 h.p. Then, too, some of our leading manufacturers of spray painting equipment and accessories have produced air-motored agitator units designed for mounting directly on any standard lacquer and paint drum or

barrel which is equipped with hand mixing facilities. One such can be supplied with a mounting adapted for either male or female thread, consumes two to three cubic feet of air per minute for driving at 35 to 50 lb. pressure. The agitator shaft proper is driven through a speed reducer from the air motor. Another manufacturer of spray-painting equipment has a somewhat similar device, also designed for driving agitators that are built integral into paint drums. It is especially good for agitating and thoroughly mixing paint in the original shipping containers, just before it is delivered to material feeding systems in finishing departments proper. The unit can be changed from one drum to another in a very short space of time, and will operate from a compressor as small as 1 h. p., or any larger machine, depending upon how much speed is desired on the agitator.

#### Drums and Tanks for Agitating

Mixing problems are simplified by having the equipment best adapted for the work. As for tanks, there is one spray painting equipment manufacturer which provides pressure tanks having clamp-type covers which can be very rapidly clamped into place. No nuts or bolts are needed. These tanks are so arranged that the builder can provide agitator units for them, in either air-motor or hand driven types and since the tanks range in capacity all the way from 6 gallons to 60, many agitation problems may be solved.

So-called mixer-drums, in which finishing materials can be shipped, are available. These usually incorporate a special strip or ribbon of steel, bent to a shape calculated to do a good job of mixing, supported on a pivot-bolt at the bottom center of the drum inside, and arranged to turn from the



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top either with a special crank-type handle or with one of the air-motor units previously described. One can mix almost any standard paint or finishing material with such a drum arrangement in about 15 minutes.

A hinged-lid type of mixing tank suited for agitating lacquer, synthetic enamels and other pigmented materials is available. The hinged lid constitutes a large part of the tank top, in order to provide plenty of room for pouring in the finishing materials being handled. Oxidation of the materials cannot take place easily. Leakage of vapors from the material being mixed cannot occur, as there is a one-piece leakproof gasket, which, under the influence of the lid clamps, seals the tank perfectly. These tanks are provided with an explosion-proof motor for driving the agitator and they are so designed that they may be interconnected in various ways, to form a battery suitable for use in paint circulating systems. Standard tanks of this size run from 30 to 120 gallon capacities, though larger tanks can be had on special order if desired.

#### Laboratory Type Mixers

Small mixers of power type are highly useful in the finishing room as well as in the laboratory which does experimental work on different types of new finishes. Many of the portable types fitted for clamping on the side of a vessel may be used in small sizes. There is, however, a mixer that is even more convenient for such applications, mounted on a standard-type rod which rises from a suitable support foot. The driving motor, with its vertically-disposed chuck, adapted for holding different types of stirring rods, may be swung in a complete circle around the rod on which it is mounted, and made secure in any one of eight positions, 45 degrees apart. Through rheostat control, a wide variety of mixing speeds can be obtained on this unit.

There is special agitating and mixing equipment which has not been mentioned here. There are for instance, drum rotating machines, designed for re-mixing finishing materials in original containers, which have no built-in mixing devices. And there is a line of mixing machinery especially adapted for finishing materials, not only for rolling drums, but also for tumbling drums, barrels and cans end over end.

(Concluded from page 321)

old brushes clean and fit and you will get many thousands of yards of additional wear out of them.

There are many reasons why we should be careful with our brushes and keep them fit to last longer. Here are a few of them—

1. Brushes are now made with bristle and horsehair, or bristle, horsehair and fibre, which reduces their efficiency. Such brushes need good care to give results.
2. Brushes are now set in substitute cements, which are more soluble than rubber. They need good care if the setting is to remain intact.

3. Brushes are now more costly and must be used longer and every bit of wear gotten out of them. They need good care if we are to get full value and best service from them.

4. MOST IMPORTANT — Bristle, rubber and steel are all vital materials needed for our war program and for painting our war equipment. The longer we use our brushes, the less of these materials do we expend needlessly. Brushes need good care to give efficient service, and by giving them that care, we help conserve these strategic war materials.



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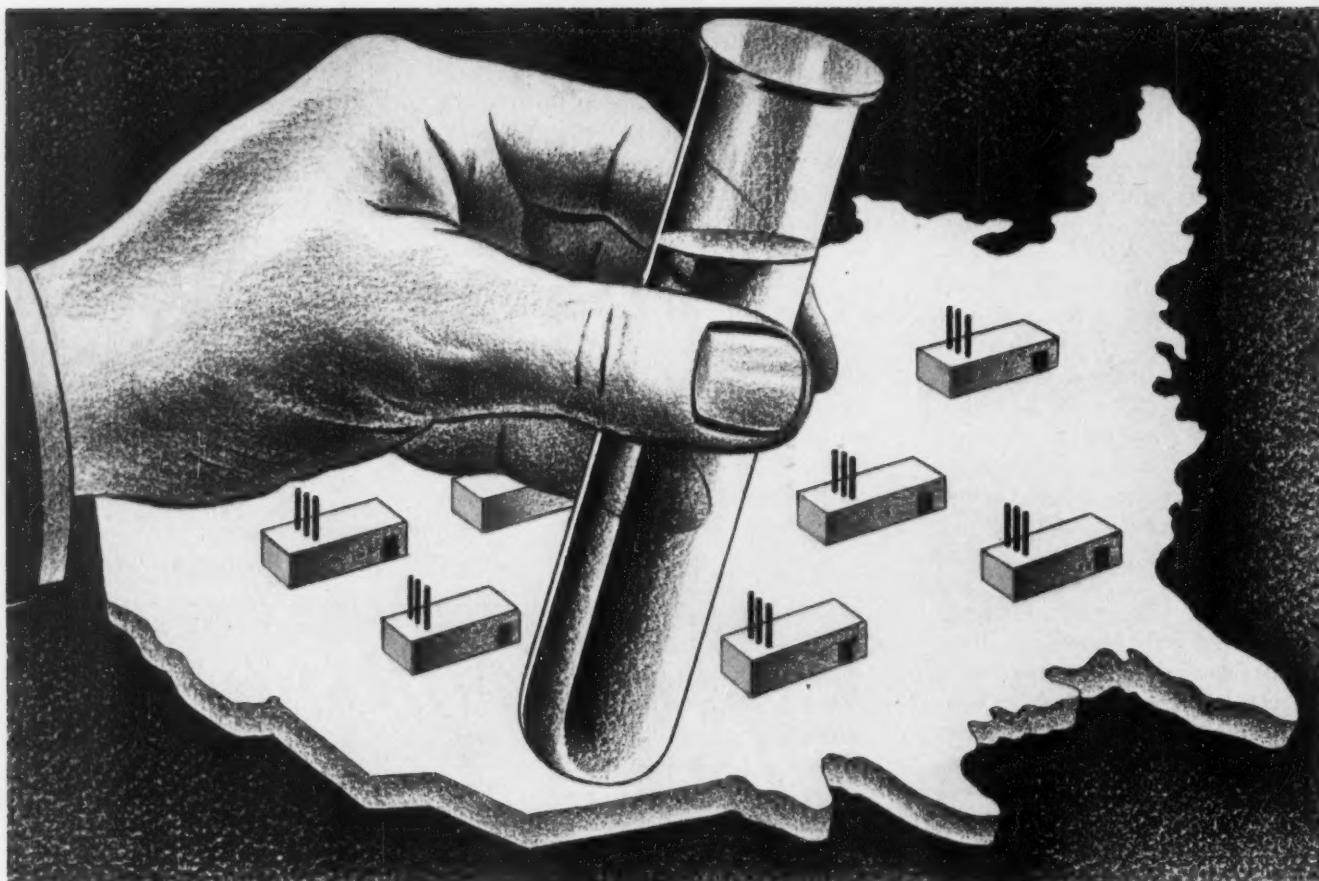
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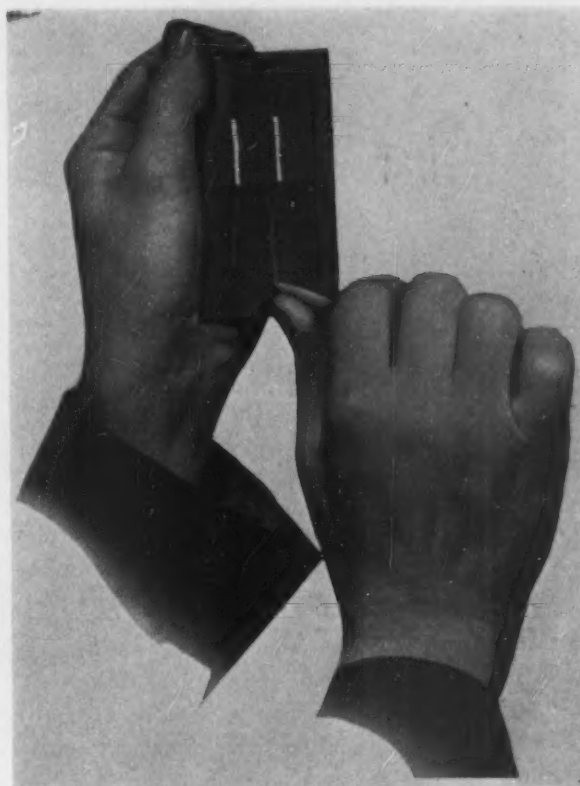
The Research Laboratories of the Parker Rust Proof Company, of Detroit, have been working for years on the development and improvement of products for protecting metals from corrosion. Parkerizing and Bonderizing have been synonymous with rust proofing on many important products such as automobiles, refrigerators, washing machines and scores of others. Recently a new development was announced in the application of Bonderizing to mill-treated electro-galvanized sheets and strip stock.

Previously this process had been applied mostly to fabricated parts just prior to final finishing, but with the introduction of Bonderized Zinc-Flash mill treated sheet and strip, the Bonderizing goes on the raw material at the steel mill and goes to factories for manufacturing purposes affording protection during shipping, storing and manufacturing operations, as well as supplying a rust resistant base for final finishes of paint, enamel or lacquer.

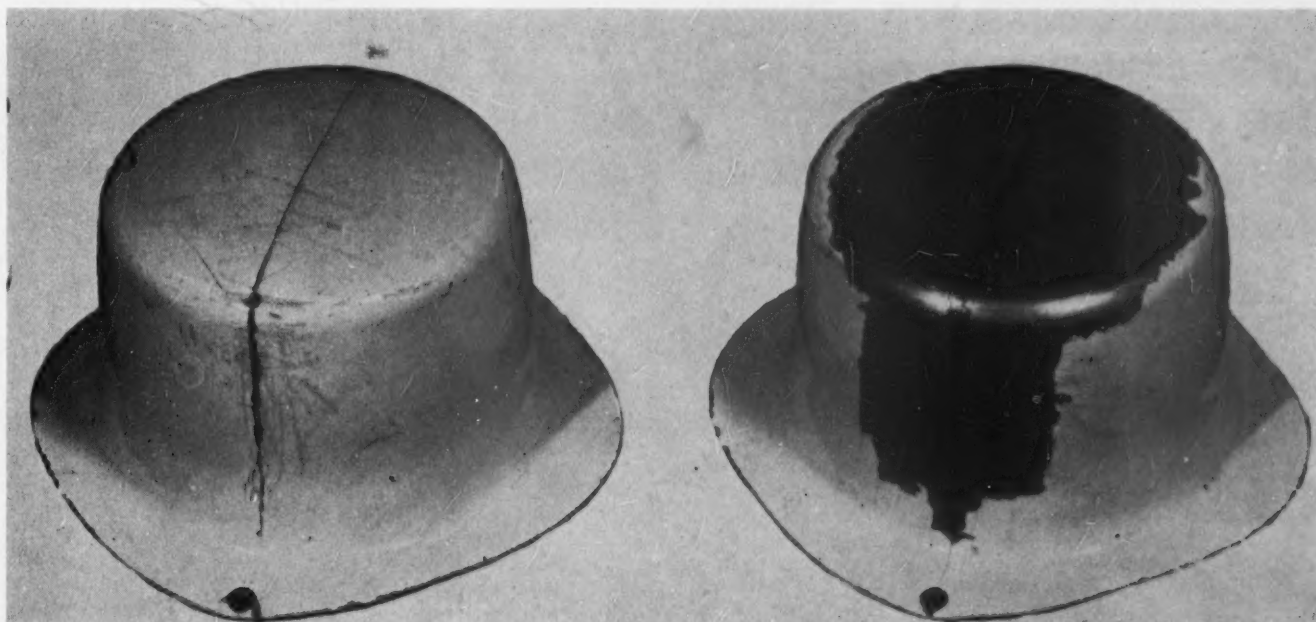
The electrically deposited coating of zinc that is the base for the Bonderized coating has maximum adherence to the steel, so that it may be stamped, formed or bent. The Bonderite coating is composed of a compact fine grain mass of microscopic crystals, and as paint is applied, it flows into the interstices around these crystals, securely bonding the dried paint to the metal base, providing a high degree of mechanical adhesion and resistance to chipping or peeling.

This process thus provides an ideal material for a wide variety of products that require a fine appearing finish, as well as one that will provide rust proofing and have the ability to retain these qualities under stamping and forming operations.

Several steel mills are already prepared to produce Bonderized Zinc-Flash sheets and strip in most wanted sizes and gauges.



Adhesion of paint provided by a Bonderized surface, as compared to paint over plain zinc-flashed surface.

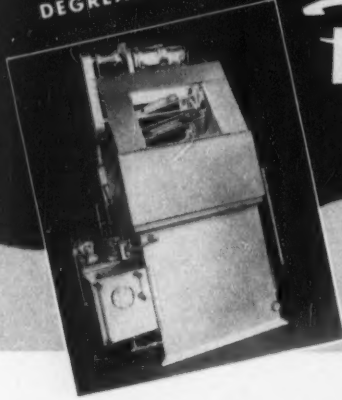



Stampings made from Bonderized (left) and plain (right) zinc-flash sheets, coated with synthetic enamel, scratched and exposed to salt spray for 400 hours.

**Stability**  
ESSENTIAL IN  
DEGREASING SOLVENTS

IS HIGHEST  
IN

**Perm-A-Clor**

Uninterrupted cleaning is assured in War Plants using Perm-A-Clor Solvent.

The difficulties encountered in the use of ordinary solvents under varying operating conditions were overcome when Detroit Rex Engineers originated the stabilization of chlorinated solvents.

High stability is our creed! That's why Perm-A-Clor is the most highly stabilized chlorinated solvent available. It will outperform all others under adverse conditions of light, heat, moisture, and mixtures of different metals, which cause the disintegration of lesser stabilized solvents.

Not only is Perm-A-Clor more stable as a liquid, but it also remains stable as a vapor and condensate.

Another Detrex solvent, Triad, is widely used for less rigorous cleaning operations, especially where only steel parts are to be cleaned. It has the same excellent cleaning qualities of Perm-A-Clor but differs in the kind and amount of stabilizer. You can choose the Detrex solvent suited to your particular cleaning operations.

**SOLVENT DEGREASING and ALKALI CLEANING**

**DETROIT REX PRODUCTS COMPANY**

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Branch Offices in Principal Cities of U. S. A. — In Canada: Canadian Hanson & Van Winkle Co., Ltd., Toronto, Ontario

#### Spray Equipment

Eclipse Air Brush Co., Inc., 390 Park Ave., Newark, N. J., have issued a 34-page booklet, "Eclipse Spray Equipment On The Job."

The booklet is devoted to illustrations of various applications of spray finishing, with emphasis on spraying shells, ships, pontoon bridges, airplane components, and other war items. Also shown are such widely varying uses of spray equipment as coating pipe, leather, bakery pans, airdrome runways, etc., each with its special equipment built around spray guns.

#### Water Emulsion Resins

Bakelite Corp., Dept. OF., 30 E. 42nd St., N. Y., N. Y., have issued a folder describing C-9 resins, newly developed synthetic resins for the formulation of protective and decorative surface coatings. The bulletin states that its purpose is to acquaint engineers and users of protective coatings with the properties provided by these resins when used as vehicles for the production of water-emulsion paints. A discussion of water-in-oil and oil-in-water dispersions and the characteristics of water emulsions based on C-9 resins are given.

## Manufacturers' Literature

#### Masking Compound

Turco Products, Inc., 6135 South Central Ave., Los Angeles, Calif., have published a description of their Masq-It, a masking material for reducing the labor required in keeping spray booths clean and free from paint coatings due to overspray.

The material is a non-inflammable liquid which is brushed or sprayed on the spray booth walls to a thickness of 0.01". After an accumulation of overspray has collected upon the walls, the coating is punctured with a putty knife and peeled off. It is said that if the overspray is not too heavy it may be removed by merely playing a stream of water on it, permitting the water to contact an edge of the paint area and seep under it. The water will dissolve the Masq-It bond between the paint and the metal surface and the paint will fall off.

It is stated that Masq-It has numerous uses other than spray booth maintenance. For example, it may be used for the protection of chromium, nickel, polished and plated surfaces, etc., and because it is transparent, it may be used on windows to protect them from corrosive substances as in the case of factories located in areas where fumes destructive to glass are present.

#### Metal Cleaning Catalogue

A new 24-page catalogue describing metal cleaning machines, processing equipment, and metal cleaning chemicals has been published by Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich. Included are descriptions and illustrations of degreasing machines, alkali washers, paint stripping tanks, aluminum processing machines, dip tanks, and rust proofing systems. Degreasing solvents and alkali cleaning compounds manufactured by the company are also described.

The last page of the catalogue gives a complete list of branch offices from which service may be obtained.

#### Spraying Equipment

Master Manufacturing Co., 4715-17 N. Damen Ave., Chicago, Ill., have issued a bulletin in which is described their various spray painting equipment. The bulletin lists their "Ace" model spray gun which can be changed from round to fan spray by pushing a button, the "Econ-O-Can" siphon feed cover which fits one quart friction type cans, and various other equipment including oil and water extractors, pressure feed tanks, exhaust fans, portable sprayers, etc. The catalogue number is 265.



#### Spray Gun Can Cover

Master Manufacturing Co., 4715-17 N. Damen Ave., Chicago, Ill., in their new bulletin No. 265, offer a siphon feed cover to fit one quart friction top cans. The advantage of this cover is said to be that different colors can be kept in the original cans, thus saving the investment in separate material cups and labor and materials in cleaning.

#### Booth Cleaning Compounds

Two compounds for use in water wash spray booths, Triad WS where oil base paints and enamels are used and Triad WSF for synthetic type coatings, are described in a new leaflet issued by Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich.

It is stated that these compounds make possible the complete control of paint pigments and other ingredients and that plugging of lines, pumps, spray nozzles, and eliminators is prevented. Varying concentrations are used, depending on the particular finishing material being sprayed. Paint materials are said to be floated to the top of the supply tank where they are removed periodically and, with the clean solution drawn from the bottom of the tank, the possibility of fouling working parts is eliminated. Other advantages of these materials described in the leaflet include coagulation at low concentrations and the elimination of excessive foaming and the danger of caustic burns.

#### Centrifugal Blowers and Exhausters

Roots-Connersville Blower Corp., Dept. O.F., Connersville, Ind., have issued Bulletin 120-B-12 covering their centrifugal blowers and exhausters. This is a 20-page booklet in two colors, profusely illustrated, applying to both single and multi-stage units in many sizes.

(All manufacturers' literature are available upon request from the company.)

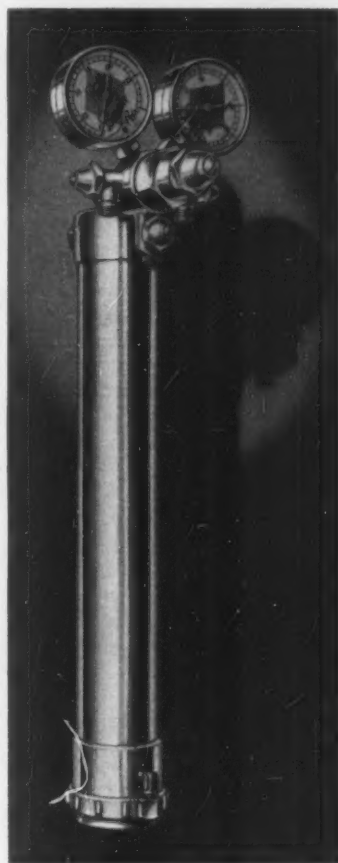
#### Specification Finishes

Maas and Waldstein Co., Dept. OF, 438 Riverside Ave., Newark, N. J., have published a revised issue of their booklet, *Information on U. S. Government Finishes*. Containing 47 loose-leaf pages in a flexible cover, the booklet describes the finishing materials made by the manufacturer to conform with various government specifications. Sections devoted to Army Ordnance Department finishes, Navy Aeronautical finishes, etc., are separated by tabbed pages for easy reference.

#### Specification Finishes

A folder, *Facts About U. S. Government Finishes*, has been issued recently by Roxalin Flexible Finishes, Dept. OF, Elizabeth, N. J. The folder contains data sheets on finishing materials made by the company to conform to U. S. Army, U. S. Navy and joint Army-Navy specifications. Each data sheet is devoted to one specification finishing material and lists use, thinning, application, drying and baking properties and other pertinent information.

## Announcing the New Improved Paasche AIRCONDITIONER UNITS



THE NEW Paasche Airconditioners assure a clean, dry supply of air so essential in producing an enduring, blemish-free finish. They are streamlined and compact in design—strongly built to withstand high pressure, hence may be used with a wide variety of air-operated machines and tools. There are no moving parts and no filtering elements that require replacement.

In actual competitive tests, Paasche Airconditioners removed the highest percentage of water from the air line.

Supplied with manual or automatic drains. The new Automatic Drain, which discharges water as it is extracted from the air line, operates on a new principle providing the most reliable method for water removal under all conditions. It ends hand draining worries once and for all and keeps airconditioner operating at peak efficiency without attention.

Incorporated in the unit is a new Paasche Airregulator, providing precise regulation of working airpressures. The adjusting assembly of the regulator can be readily turned to obtain the desired airpressure—yet can be locked in place in an instant.

Paasche Airconditioners are supplied in sizes and types for every industrial finishing requirement—6, 12, 24, 48 and 96 cubic ft. capacity sizes.

Write for further information and literature on Paasche airconditioners and airpainting equipment.

**Paasche Airbrush Co.**

1908 Diversey Parkway

Chicago, Illinois

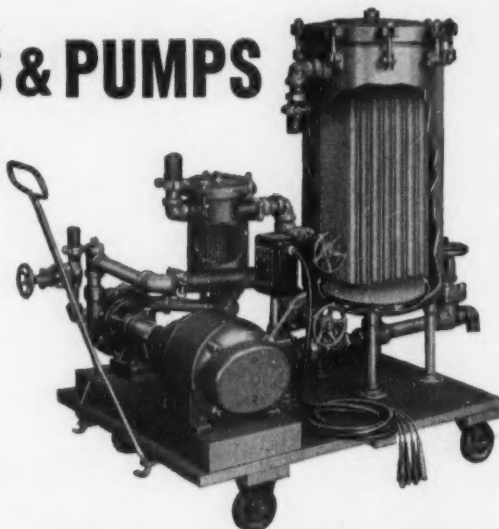




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KEROSENE  
VARNISH  
ALCOHOL &  
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We carry a large stock of Filter & Pump accessories, hose, valves, fittings. All grades of filter cloth, filter aids, & FILTERBESTOS. Ready for shipment.



## SALT SPRAY CORROSION TEST EQUIPMENT

Designed to determine the corrosion resisting qualities of plated or coated metal, alloys, metal parts, organic finishes, etc. This equipment combines necessary features so that Salt Spray tests can be conducted to specifications at Controlled Temperatures to 130 Deg. Fah.

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3017 WEST CARROLL AVENUE CHICAGO, ILLINOIS

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height and angle  
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Whatever your buffing requirements, there's a Marschke built to do the job right. Marschke Quality pays off in extra years of trouble-free life.

Included are single and selective speed, independent spindle drive, bench, pedestal and swing frame types. Available to you also is a special Marschke service for adapting standard types to particular uses. Write for the Marschke Buffer Bulletin and Catalog To—

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\*Marschke Selective Speed  
Buffer, built for hard  
continuous service.

## Shop Problem

### Problem No. 9. Film Thickness

**Problem.** A job finishing shop has contracted to dip-finish a number of flat rectangular plates with a black baking enamel. The specifications require that the enamel be applied in such a manner that, after baking, any one square inch of area of the plates shall have not less than 0.02 grams nor more than 0.035 grams of enamel. The specifications further require that a minimum of one from each thousand plates be checked for the amount of enamel applied.

Because of the saving of time and other advantages of checking the thickness rather than the weight of enamel applied, the shop wishes to use its paint film thickness gauge. However, it does not have the specification limits in terms of film thickness. What are the limits of thickness of film which correspond to the weight of film limits given in the specifications?

**Solution.** The thickness of a film of finishing material may be calculated from its weight by means of the following equation.

$$T = \frac{(W)}{(D) (16.39)}$$

where (T) is the thickness of film in inches, (W) is the weight of film on one square inch in grams, (D) is the density of the film in grams per cubic centimeter, and (16.39) is a constant.

In the case under consideration the density of the film is found to be 0.85 grams per cubic centimeter. Using the above equation, the film thickness corresponding to a film weight of 0.02 grams per square inch is

$$T = \frac{(0.02)}{(0.85) (16.39)} = 0.001435 \text{ in.}$$

and the film thickness corresponding to a weight of 0.035 grams is

$$T = \frac{(0.035)}{(0.85) (16.39)} = 0.00251 \text{ in.}$$

# NEW EQUIPMENT AND SUPPLIES

LATEST COMMERCIAL DEVELOPMENTS IN ORGANIC FINISHING

## "Hevealac" Finish

Glyco Products Co., Inc., 230 King St., Brooklyn, N. Y., in their *Chemicals by Glyco* catalogue describe "Hevealac," a high gloss finish for rubber, synthetics and fabrics where high elasticity is necessary. A resin solution in alcohol, this material is applied by brushing, dipping or spraying. It is said to be practically non-inflammable when dry, to adhere strongly to most surfaces, to retain flexibility at low temperatures, and to be unaffected by water, oils and most hydrocarbons.

## Hot Lacquer Equipment

Two units for the application of finishing materials at elevated temperatures are announced by The DeVilbiss Company, Dept. OF., Toledo, Ohio.

Type QBH-501, a steam heated unit, consists of a steam heater having tinned copper coils with a heating area of 12 square feet and a capacity of 1½-2 gallons. An air driven motor pump circulates the material through the coils, through the fluid hose to the gun, and back to the pump. The unit is fitted with material strainer, air operated thermostat, safety valve, automatic condensed water drain, temperature control, and pressure gauge.

Type QBH-521, a hot water operated unit, is similar in construction to the steam operated unit except that the heater is of larger capacity, having 15 square feet of heating coil surface, and is equipped with a hot water circulating pump. It is completely automatic, having a thermostat and air operated hot water inlet valve which permits close control of the temperature of the material being sprayed.

Complete details may be obtained by writing to the company.

## Non-Slip Floor Paint

American Abrasive Metals Co., Dept. OF., Irvington, N. J., are the manufacturers of Fera-Flow, a special floor paint recommended for use where there may be a slipping hazard. This material, said to contain no sand or ground glass, is made with a special granular ingredient. It is claimed to produce a long-wearing, non-slip surface which provides safe footing.

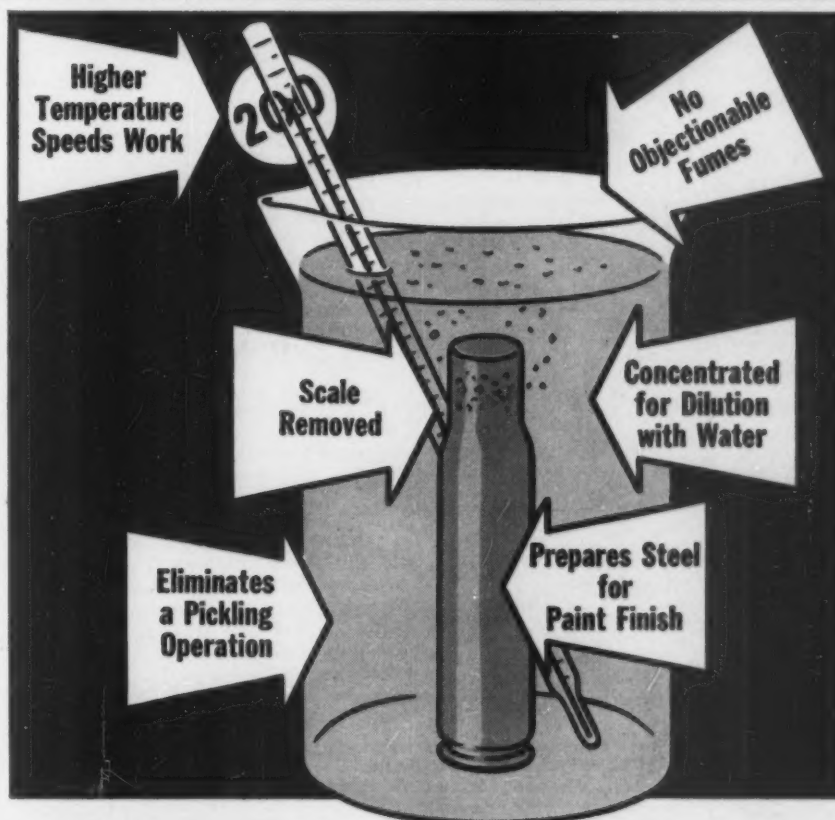
Fera-Flow is made in gray, red, green, brown, and black. It is applied by brushing, dries overnight, and may be used on floors of wood, steel, or concrete or over old paint. On new floors, two or three coats over a good filler are recommended. It may be applied over old paint if the surface is thoroughly cleaned.

## Spray Gun

A spray gun incorporating a control for changing quickly from round spray to fan

spray is manufactured by Master Manufacturing Co., 4715-17 N. Damen Ave., Chicago, Ill. It is known as the "Master Hy-Speed Ace" model. A small button on the gun is pushed to obtain the round spray. When the button is released the original fan is obtained. The fan spray size and shape may be adjusted as desired. In addition to the

button control feature, this gun has a removable spray head, self-seating air valve, and removable air filter. It is said to operate easily and efficiently on from 7-15 cubic feet of air per minute at 20-90 pounds air pressure, as required by the particular material being sprayed, and to handle a large volume of work at extremely low pressures.



## "DEOXIDIZE" for varnish finish with the New "170" type ACP DEOXIDINE

Whether you are preparing steel artillery shell cases, or any other metal product (except zinc) for varnish or paint finish you should investigate the new "170" type DEOXIDINE. For use in a dip operation, at either high or low temperature, to remove light annealing scale—thus eliminating an extra pickling bath—and also to perfectly prepare the surface for the paint finish, all in one simple operation.

Samples and directions for use sent upon request.

*Manufacturers of Inhibitors and Metal Working Chemicals*

**AMERICAN CHEMICAL PAINT CO.**  
 MAIN OFFICE AND WORKS  
 AMBLER, PENNA.

**ACP**



DETROIT, MICH., 6335 Palmer Ave., E.  
 CANADIAN BRANCH  
 WALKERVILLE, ONT.

## Maintenance Paints

S. C. Johnson and Son, Inc., Dept. OF., Racine, Wis., have announced their new war formula paints for machinery, mills, offices, etc. These paints, made from materials available today, are said to retain the advantages of the wax-fortified line of paints made previous to the war. They may be used on old or new surfaces of wood, brick, metal, and plaster, may be applied by brushing or spraying, and cover from 400-600 square feet per gallon depending on surface conditions and application methods used. Various colors are available in flat, semi-gloss, and gloss types. Primers and undercoaters are also available.

A copy of a booklet in which the various materials are described may be obtained by writing to the manufacturer. The booklet also contain color chips, a price list, and a list of branch offices and warehouses.

## Spray Booth Safeguard

The old method of covering the inside of spray booths by using soap, oils, or heavy grease, was not satisfactory. It required considerable labor and did not lessen the fire hazard, which is almost always present in any spray booth.


A new method, announced by Wyandotte Chemicals Corp., Dept. OF., Wyandotte, Mich., involves the use of the company's Spray Booth Coating, a powdered material, which is mixed with water to about the consistency of thick paint. It may then be brushed on the sides and ceiling of a spray booth; or may be applied with a spray gun. As it dries, it leaves a thin application on the inside of the spray booth to which paint or lacquer adheres. The old coating peels right off to clean the inside of the spray booth. As one user expressed it, "We can clean a spray booth 8' x 8' x 20' in about

30 minutes, making it as clean as it was the day it was installed." This simple coating operation is claimed to be unusually helpful because it not only saves the time of the operator, but considerably reduces the fire hazard as well. This product has the approval of "Associated Factory Mutual Fire Insurance Companies."

If reclaiming of pigment is of interest, Wyandotte Chemicals Corp. have special products for use in water-curtain type spray booths.

## New Airconditioner Unit for Compressed Airline

Paasche Airbrush Co., Dept. OF, 19 Diversey Parkway, Chicago, Ill., have announced the development of a new type air conditioner unit for removing water, oil and dirt from compressed airlines. It is asserted that actual tests have proved the unit to be 96 per cent efficient.



**For Faster Production of  
FINISH BAKING  
Choose DESPATCH**

If you find it hard to keep pace with war production requirements because of inadequate finish-baking equipment, our 41 years experience in this field may help.

Today thousands of firms engaged in finish-baking on a large scale are using Despatch ovens. Most of these ovens are being operated 24 hours a day and have established all-time "highs" in finish-baking output.

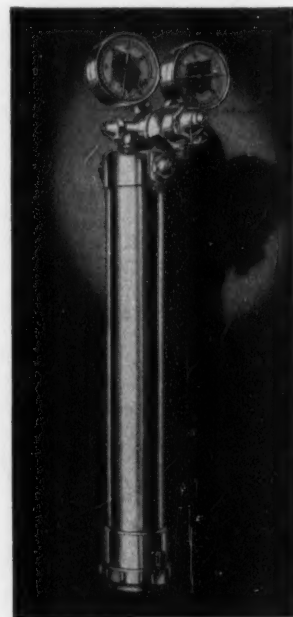
All these users report faster baking . . . less labor required . . . less space used . . . less fuel consumed. And their record-breaking output has been of excellent quality.

**SELECT ONE OF THESE  
STANDARD DESPATCH OVENS . . .**

SHELF TYPE	RACK TYPE
MONORAIL TRUCK TYPE	
INTERMITTENT CONVEYOR	
CONTINUOUS (TUNNEL) CONVEYOR	
ELEVATED CONTINUOUS CONVEYOR	
MULTIPASS Automatic CONVEYOR	
VERTICAL TYPE CONVEYOR	

**WIRE OR PHONE** for full details; over 100 standard models from which to choose.

**DESPATCH**  
OVEN COMPANY MINNEAPOLIS



The unit is constructed of non-corrosive metal throughout and filtration is mechanical with no moving parts. No cotton, felt or fibrous filtering elements that require frequent replacement are employed.

All air conditioner units can be supplied with the company's new water drain which operates on a new principle and which automatically discharges water as it accumulates, thus eliminating daily hand-draining and preventing the trouble brought on by neglect of this important duty. Incorporated is an air regulator said to insure precise regulation of working air pressures and to provide such features as the streamlined, machined brass body and pressure locking adjustment assemblies. The distinctive design of the regulator is an important factor in the large air capacity of the unit.

The unit is supplied in five sizes—6, 12, 24, 48 and 96 cubic foot—with one to three outlets.



## Patents

### Coating Composition

*U. S. Pat. 2,315,347.* W. K. Moffett, assignor to E. I. duPont de Nemours & Co., March 30, 1943. A coating composition which is highly resistant to oils and greases consisting of (A) a normally non-gelling coating composition containing cellulose nitrate and a non-gelling, non-hydroxy, non-drying vegetable oil modified alkyd resin characterized by an acid number of less than 10 and (B) in addition thereto an aliphatic dicarboxylic acid in the proportions of between 0.2 and 2.0% by weight of the total coating composition.

### Paint Strainer

*U. S. Pat. 2,315,842.* M. Dariano, April 6, 1943. A strainer-cloth holder comprising, an annulus of resilient sheet metal or the like having a diameter less than that of the bucket on which it is to be mounted, and having lips punched outwardly and upwardly therefrom intermediate its width and spaced about its periphery and adapted to seat on a bucket top to support the lower portion of the annulus within the bucket, and said annulus having strainer-cloth engaging teeth formed integrally therewith and on the top edge thereof.

### Spraying Asphaltic Coatings

*U. S. Pat. 2,314,329.* W. M. Ericson, March 23, 1943. A method of producing a stable quick setting dry asphalt coating, said method including the spraying of molten asphalt in the form of a coating upon the work, the admixture with the molten asphalt occurring immediately in advance of the work and the conjoint delivery to the work in the same spray of a liquid material comprising a liquid carrier vaporizable at the temperature of said molten asphalt and a substance borne by said carrier and adapted mechanically to resist subsequent flow of said asphalt following its setting, said substance being selected from a group consisting of sodium silicate and non-molten asphalt of higher melting point.

### Improved Paint Oils

*U. S. Pat. 2,311,681.* R. S. Morse, assignor to Distillation Products, Inc., Feb. 23, 1943. The process of producing an improved drying oil which comprises in combination subjecting a bodied drying or semi-drying vegetable or animal oil to high vacuum, unobstructed path distillation until not more than about 12% of said bodied vegetable or animal oil has been distilled and then removing the undistilled portion of the bodied oil from the still as the improved drying oil.

## VALUABLE REFERENCE BOOKS

### "Principles of Electroplating & Electroforming"

By Blum & Hogaboom. \$4.50

### "Electrodeposition of Metals"

By Langbein and Brann. \$7.50

### "Finishing Metal Products"

By H. R. Simonds. \$3.50

### "Industrial Electrochemistry"

By Dr. C. L. Mantell. \$5.50

### "Metal Coloring and Finishing"

By Hugo Krause. \$5.00

### "Metal Coloring"

By A. H. Hiorns. \$2.40

### "Protective Coatings for Metals"

By Burns & Schuh. \$6.50

### "Modern Electroplating"

By Electrochemical Society. \$5.50

### "Plating & Finishing Guidebook, 1942"

Edited by Dr. Walter Meyer. \$0.50

### "Plating & Finishing Guidebook, 1941"

Edited by Dr. Walter Meyer. \$1.00

Book Orders Are Payable in Advance.

## METAL FINISHING

11 West 42nd Street

New York, N. Y.

### Coating Process

*U. S. Pat. 2,316,041.* G. E. Armentrout, assignor to E. I. duPont de Nemours & Co., April 6, 1943. The process of producing a simulated hammered metal finish which comprises applying to a rigid base a substantial film of a composition containing a film-forming agent, at least one volatile solvent, 2-15% granular pigment, and from 1-5% of a flake metallic powder, allowing the film to partially set by evaporation of the solvent, immediately thereafter spattering thereon a composition consisting of highly volatile solvents for the film-forming agent, substantially in the form of coarse droplets under a fluid pressure of about 2 lb. and an air pressure of less than 15 lb. per sq. in. whereby the spattered solvent dissolves the film-forming agent and thereby forms apparent metallic craters, and drying the same to a hard finish.

### Air Cleaner

*U. S. Pat. 2,314,673.* G. N. Clark and E. R. Lesage, March 23, 1943. In a device of the class described, spaced circular ring supports, one above the other, spacing means between said supports and forming with them a skeleton cylinder, and yarn wrapped about the supports to form upwardly extending circular concentric walls of strands that are substantially parallel, the strands of each wall being in contact.

### Resin

*U. S. Pat. 2,313,678.* J. K. Simons, assignor to Plaskon Co., Inc., Mar. 9, 1943. A method of preparing a solution suitable for use as a lacquer that comprises bringing an ethyl silicate, water and an alkylated reaction product of formaldehyde and urea substantially free from hydroxy groups together in organic solution in a solvent capable of forming a solution with said ingredients.

### Flat Lacquer Finish

*U. S. Pat. 2,312,309.* C. Bogin and H. L. Wampner, assignors to Commercial Solvents Corp., Mar. 2, 1943. The process of forming a nitrocellulose lacquer film with a flat finish comprising applying the lacquer to a base while the lacquer is hot and at a temperature substantially above atmospheric temperature but below a temperature at which excessive decomposition of the lacquer occurs due to heat, the lacquer containing carnauba wax in an amount ranging from approximately 0.3% to approximately 1.1% based on the weight of the solid constituents of the lacquer, which is substantially completely soluble in said lacquer at said application temperature but in excess of that which is soluble in said lacquer at atmospheric temperature, the said amount of wax being below that required to produce the same degree of flattening with the same lacquer when applied at atmospheric temperature, such an amount of carnauba wax not substantially delaying the drying and hardening of said lacquer film.

### Coating Composition Containing Shellac

*U. S. Pat. 2,311,911.* R. C. Swain and P. Adams, assignors to American Cyanamid Co., Feb. 23, 1943. A coating composition containing shellac and a melamine-formaldehyde resin which has been alkylated with an alcohol containing from two to eight carbon atoms, wherein the molal ratio of formaldehyde to melamine is between about 2.5:1 and 6:1.

### Overspray Recovery Process

*U. S. Pat. 2,315,125.* J. G. Meckler, March 30, 1943. A method of preparing a coating composition in the form of an aqueous emulsion from excess sprayed coating material obtained by directing the overspray into a curtain of water forming a hydrated sludge, adding to said hydrated sludge an organic solvent to restore the solvent content for re-use as a finishing composition, an emulsifying agent and water, the water being sufficient to adjust the components to have present in the finished product an amount not over 50% by weight of the finished product, and thoroughly agitating the mixture to produce a water-in-oil type emulsion capable of use as a spray finish.

### Bronzing Material

*U. S. Pat. 2,312,088.* C. S. Fleming, Feb. 23, 1943. A coating composition comprising a vehicle base containing oil and resin heat treated in the presence of an anti-polymerization agent and having the property of drying as a hard permanent film, said base containing a fatty acid leafing agent selected from the group consisting of stearic acid and myristic acid, and an alkyl ester of a monobasic fatty acid said ester having a boiling point above about 212°F. and a bronzing powder.

### Finishing School

Wartime finishing methods is the keynote of the first half 1943 schedule of the De Vilbiss Training School for industrial spray operators announced by The De Vilbiss Co., Toledo, O.

Sessions start April 19th, May 17th, and June 21st and continue for one-week periods. Classes are open to all users of De Vilbiss Spray Painting Equipment. There's no tuition fee—no obligation on the part of the individual or the firm represented.

The training course includes class and shop instruction in the use and care of equipment and other phases of wartime finishing practices.

The growing demand for faster application of those essential, protective war coatings and the problems of labor turn-over and manpower shortage make the De Vilbiss School a timely help in filling an urgent need of industry. Further information and reservations can be secured by mail.

*New Wrinkle, Inc.*, Dayton, O., have announced the removal of their research and development laboratories to new quarters adjoining their general offices at 314 W. First St., Dayton, O.

This change was necessary to accommodate an enlarged staff and research facilities.

The company is a research and development organization serving plants manufacturing wrinkle coating compositions, synthetic resins, and related products.

## KREIDER Centrifugal Dryer

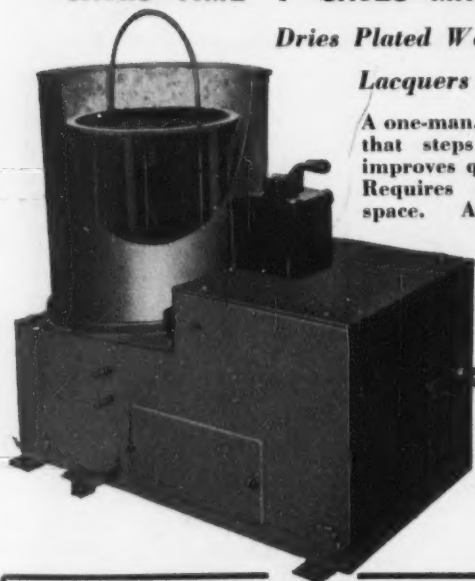
**SAVES TIME . SAVES MANPOWER**

*Dries Plated Work*

*Lacquers Small Parts*

A one-man, high-speed dryer that steps up production, improves quality, cuts costs. Requires minimum floor space. All steel, electric welded construction; 3/4 H.P. motor; V-belt drive; anti-friction bearings; foot brake and reversing drum switch. Auxiliary heating unit available.

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Here is a priority-free finish that is highly resistant to rust, corrosion, heat, impact, abrasion, scratch, acids and alkalis. It can be applied to practically any metal product by spraying, then cured through a heat cycle of from 250° to 700° F. Although ceramic in nature, there is no relationship or comparison between ARMOR-VIT and porcelain enamel, paint, lacquer or synthetic finishes. It is non-volatile and non-explosive. It is undismayed by heat of over 1000° F., and has high resistance to thermal shock. It is unaffected by the standard 200-hour salt spray tests, or accelerated weathering tests equal to over 5 years normal weather. ARMOR-VIT is a coating less than 1/1000th of an inch in thickness. It goes farther and lasts longer.

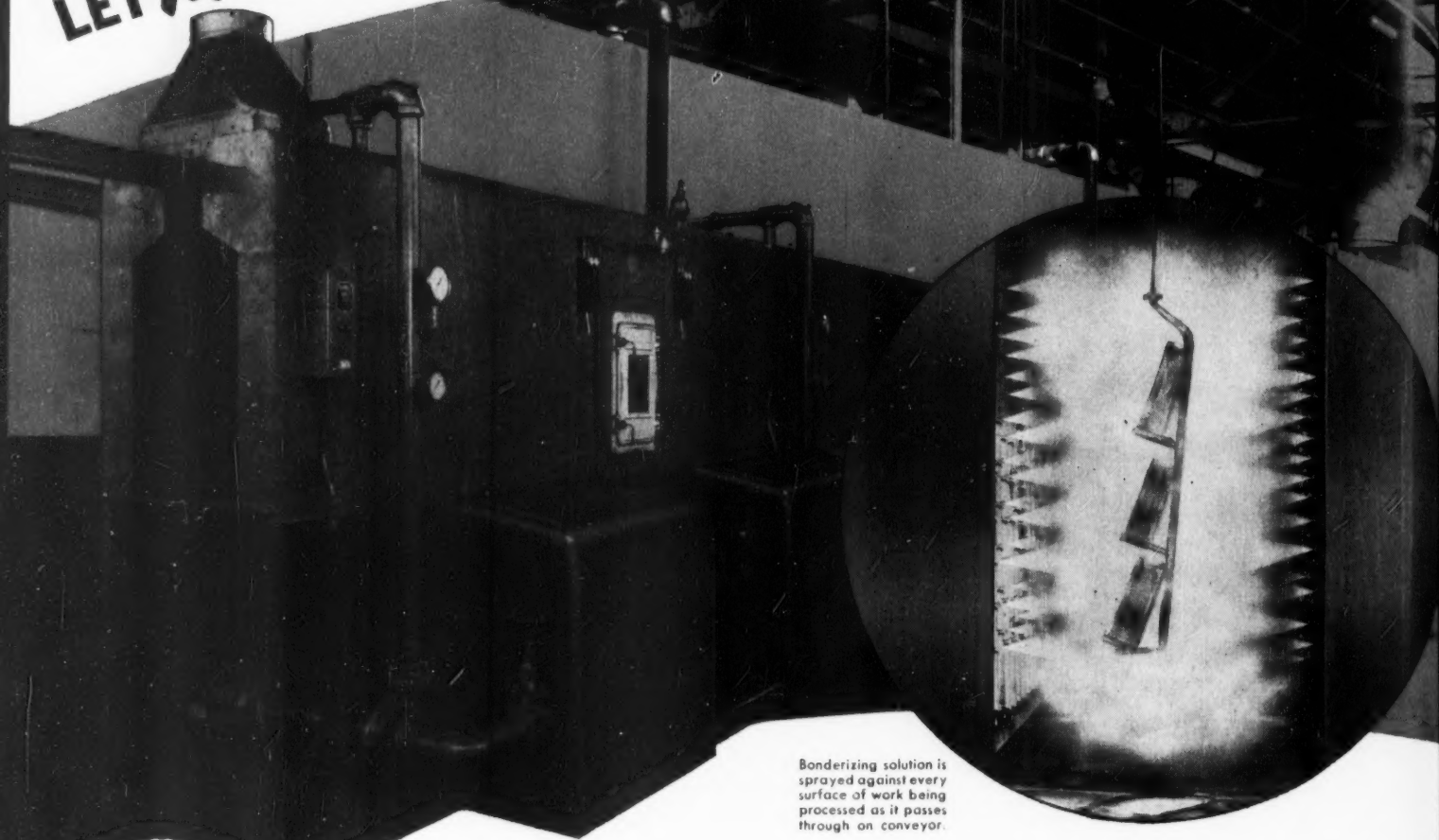
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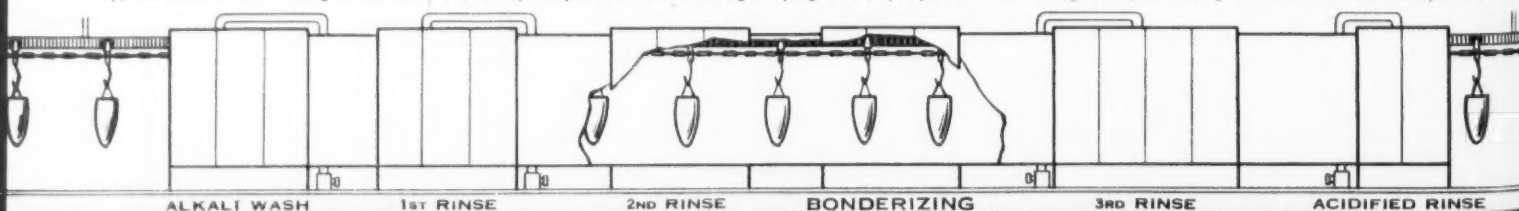


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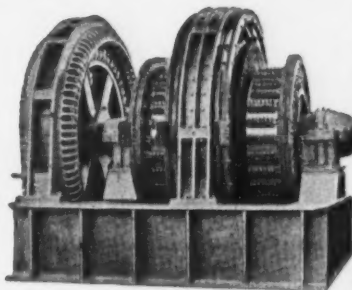
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## INDEX TO ADVERTISERS

**A**  
Abbott Ball Co., Hartford, Conn..... 299  
Acme Mfg. Co., Detroit, Mich..... 5  
Agerstrand Corp., Muskegon, Mich..... 35  
Alrose Chemical Co., Providence, R. I..... 303  
Alsop Engineering Corp., Milldale, Conn..... 20  
Alvey-Ferguson Co., Cincinnati, Ohio..... 325  
American Chemical Paint Co., Ambler, Pa..... 331  
American Nickeloid Co., Peru, Ill..... 307  
Astle Co., H. J., Providence, R. I..... 298

**B**  
Bacon Felt Co., Winchester, Mass..... 297  
Baird Machine Co., The, Bridgeport, Conn..... 6  
Baker & Co., Inc., Newark, N. J..... 26  
Baker, M. E. Co., The, Cambridge, Mass..... 35  
Beam-Knodel, Inc., New York..... 35  
Beckman Instruments Div., National Technical Laboratories, South Pasadena, Cal..... 289  
Belke Mfg. Co., Chicago, Ill..... 19  
Binks Mfg. Co., Chicago, Ill..... 320-321  
Bristol Brass Corp., The, Bristol, Conn..... 306  
Buckingham Products Co., Detroit, Mich..... 299

**C**  
Chicago Vitreous Enamel Product Co., Cicero, Ill..... 335  
Chicago Wheel & Mfg. Co., Chicago, Ill..... 317  
Chromium Process Co., Shelton, Conn..... 305  
Clinton Supply Co., Chicago, Ill..... 35  
Crown Rheostat & Supply Co., Chicago, Ill..... 296

**D**  
Darco Corporation, New York, N. Y..... 10  
Dellinger Mfg. Co., Lancaster, Pa..... 334  
Despatch Oven Co., Minneapolis, Minn..... 332  
Detroit Rex Products Co., Detroit, Mich..... 328  
The DuBois Co., Cincinnati, Ohio..... 297  
Dulite Chemical Corp., Middletown, Conn..... 16  
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del..... 25

**E**  
Edmont Mfg. Co., Coshocton, Ohio..... 304  
Egyptian Lacquer Mfg. Co., New York..... 312  
Enthone Co., New Haven, Conn..... 3, 301-334

**G**  
General Ceramics Co., Keasby, N. J..... 12  
General Chemical Co., New York, N. Y..... 22  
General Electric Co., Bridgeport, Conn..... 8  
General Solvents Co., Inc., Rochester, N. Y..... 27  
Green Electric Co., W., New York, N. Y..... 31  
Gumm Chemical Co., Inc., Frederick, Kearney, N. J. 2

**H**  
Hamilton Emery & Corundum Co., Chester, Mass..... 306  
Handy & Harman, New York, N. Y..... 28  
Hanson-Van Winkle-Munning Co., Matawan, N. J. 1  
Harrison & Co., Haverhill, Mass..... 302  
Harshaw Chemical Co., The, Cleveland, Ohio..... 24  
Hartford Steel Ball, Hartford, Conn..... 37  
Hay Co., Jacob, Chicago, Ill..... 306  
Hogaboom, G. B. Jr., & Co., Newark, N. J..... 288  
Holland & Sons, Inc., Brooklyn, N. Y..... 36  
Houghton, E. F., Philadelphia, Pa..... 295

**I**  
Industrial Filter & Pump Mfg. Co., Chicago, Ill..... 330  
International Rustproof Corp., Cleveland, O..... 333

**J**  
S. C. Johnson & Son, Inc., Racine, Wis..... 324

**K**  
Keystone Emery Mills, Philadelphia, Pa..... 307  
Kirk & Blum Mfg. Co., Cincinnati, Ohio..... 291  
Kocour Co., Chicago, Ill..... 301  
Kushner, Joseph, New York..... 288

**L**  
Lasalco, Inc., St. Louis, Mo..... 21  
Lea Mfg. Co., The, Waterbury, Conn..... 34  
L'Hommedieu & Sons Co., Chas. F., Chicago, Ill..... 9  
Lupomatic Tumbling Machine Co., New York, N. Y. 306

**M**  
Maas & Waldstein Co., Newark, N. J..... 322  
MacDermid Inc., Waterbury, Conn..... Inside Back Cover  
Magnus Chemical Co., Garwood, N. J..... 298  
Magnuson Products Corp., Brooklyn, N. Y..... 300  
Mahon Co., R. C., Detroit-Chicago..... 336  
McAleer Mfg. Co., Detroit, Mich..... 294  
Mitchell-Bradford Chem. Co., Bridgeport, Conn..... 300  
Motor Repair Co., Cleveland, O..... 36  
Munning & Munning, Inc., Newark, N. J..... 307  
Mutual Chemical Co. of America, New York, N. Y. 302

**N**  
Nankervis, George L. Co., Detroit, Mich..... 30  
National Sherardizing & Mach. Co., Hartford, Conn..... 305  
Novitsky, Joseph, Hollis, L. I., N. Y..... 304

**O**  
Oakite Products, Inc., New York, N. Y..... 4  
Oriental Rouge Co., Inc., Bridgeport, Conn..... 37

**P**  
Pasche Airbrush Co., Chicago, Ill..... 329  
Pennsylvania Salt Mfg. Co., Philadelphia, Pa..... 23  
Pittsburgh Plate Glass Co., Pittsburgh, Pa..... 18  
Platers Technical Service Co., New York..... 288  
Plating Equipment & Supply Co., New York..... 36  
Platt Bros. & Co., The, Waterbury, Conn..... 302  
Powers Regulator Co., Chicago, Ill..... 305  
Precimet Laboratories, New York..... 15  
Puritan Mfg. Co., Waterbury, Conn..... 37

**Q**  
Quinn Co., Nelson J., Toledo, O..... 293

**R**  
Roberts Rouge Co., Stratford, Conn..... 37  
Robinson, A., & Son, New York..... 288  
Roe, Lewis Mfg. Co., Brooklyn, N. Y..... 36

**S**  
Sarco Co., Inc., New York..... 303  
Siefen Co., J. J., Detroit, Mich..... 14  
Simpro Corp., Newark, N. J..... 307  
Standard Plating Rack Co., Chicago, Ill..... 306  
Stanley Chemical Co., East Berlin, Conn..... 326  
Stevens, Inc., Frederic B., Detroit, Mich..... 11  
Sturgis Products Co., Sturgis, Mich..... 7  
Sulphur Products Co., Greenburg, Pa..... 296

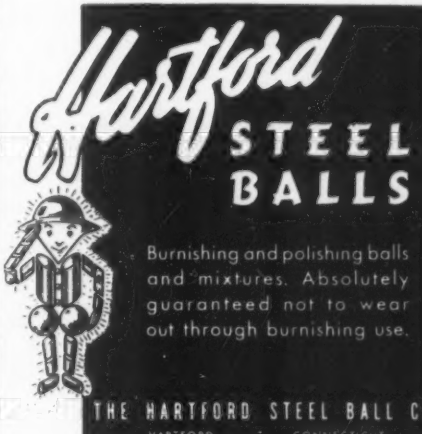
**T**  
Technical Processes Div. of Colonial Alloys Co., Philadelphia, Pa..... 22  
Turco Products, Inc., Los Angeles, Cal..... 291

**U**  
The Udylite Corp., Detroit, Mich..... 17  
United Chromium, Inc., New York..... 13  
United Platers, Inc., Detroit, Mich..... 35  
U. S. Galvanizing & Ptg. Equipment Corp., Brooklyn, N. Y..... 32  
U. S. Stoneware, Akron, Ohio..... Back Cover

**V**  
Vulcan Detinning Co., The, Seward, N. J..... 307  
Vonnegut, Indianapolis, Ind..... 330

**W**  
Waterbury Rolling Mills, Inc., Waterbury, Conn..... 305  
Whittaker, Clark & Daniels, Inc., New York, N. Y. 14  
Wyandotte Chemicals Corp., J. B. Ford Division, Wyandotte, Mich..... 29

**Z**  
Zapon Co., Division, Atlas Powder Co., New York and Stamford, Conn., & Chicago, Ill..... 310



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*Washing a Cellophane Shirt:* We recently received the following objection (written in pencil and without any signature) from one of our boosters: "Soaking a cellophane sheet in acetone and expecting to use it again is like washing a woolen shirt in a hot alkali cleaning tank. It should be done to be appreciated." The reference was to the last paragraph of the article on pearl essence (*Organic Finishing*, February 1943, pp. 123-4) in which directions were given for using a sheet of cellophane for reclaiming pearl essence overspray.

That one had us dreaming of washing cellophane shirts in hot alkali acetone tanks until like a flash we decided to obtain an opinion from the manufacturers of the stuff. Their reply was as follows: "There are many types of transparent sheeting available, many of which are commonly referred to as cellophane. Our Cellophane, both plain and moisture-proof, is not soluble in acetone."

The point of this whole thing is that we know we are losing our grip. The word was printed as cellophane (general) when it should have been Cellophane (specific). That one little letter "C" got by us and spoiled our proof-reading record. Perhaps we should have included an explanatory paragraph in the article about making sure to use an insoluble sheet. It would have saved us a lot of bother. On the other hand, it is stuff like this that fills up this column of stuff.

*Correction:* In the March issue we mentioned on this page that *Popular Science Monthly* had given the answer to a bouncing ball problem as 47.999969482421875 feet. This was the wrong answer. They have been advised by an observant subscriber (not us) that the correct answer should have been 47.999969482421874 feet and all readers are hereby advised to correct their notes and technical files accordingly.

Now that we have recovered from our last attack of sniffles we learn that among the reasons for rationing fuel oil and gasoline last winter was the fact that for a hop

across the Atlantic and back with a convoy, a destroyer uses enough fuel oil to heat 100 average homes for a whole year. And in an hour's cruising a four-engined bomber burns as much gasoline as the family car used to consume in 6 months. We apologize to our landlord and from now on will enjoy straphanging in the subway and standing in crowded buses.

*Bright Idea Dept.:* On the subject of buses we have just been struck by the "flash of genius" which the Supreme Court has ruled to be a necessary feature of a patentable invention. Why not make a bus with two front ends, since no one moves to the rear of a bus anyhow? There probably is nothing patentable about this invention, but, following some well known precedents, we are going to apply for one just the same as soon as we accumulate enough of the pennies which we can no longer put in the gum vending machines because most of them haven't any gum in them these days.

In the meantime, also following an example already set in our industry, as a contribution to the war effort we are prepared to issue royalty free licenses to plants engaged in war work and to supply them with free engineering service for the purpose of assisting them in the proper construction of this Siamese vehicle. However, we will positively not make up samples and all licensees must do their own worrying about infringement on patents which may now be in force.

*What We Learn From the Ads:* A supplier of babbitt bearing metals calls one of his products DAMTITE. For Shame!! And a Rhode Island manufacturer ran an ad last month with only the following in it: "WE HAVE NOTHING TO SELL FOR THE DURATION. OUR PLANT IS DOING WAR WORK." What is there left to say?? . . . Except that a press release from a company who should know better mentions *positive* and *negative* anodes.

*Slogan of the Month:* It is Better to Buy Bonds Than to Wear Them.

**Our Readers Write Us**  
PURROWS PLATING WORKS  
RUST-PROOFERS  
93-95 Bridge Road, Camperdown  
N.S.W. Australia

February 26th, 1943

The Manager,  
*Metal Finishing*, Metal Industry Publishing Co., Inc.  
11 W. 42nd Street  
New York, N. Y., U. S. A.  
Dear Sir,

Please find enclosed money order for \$10 (£2-10-0) covering our subscription to *Metal Finishing* for two years.

The last monthly volume received from you was for November 1941 and the last "Guidebook" 1940. As we

have all volumes and "Guidebooks" dating from 1930 to above date, November 1941, we would like you to send us the missing volumes and "Guidebooks" up to present date. If you cannot complete above, please send any available issues.

It might be of interest to you to know we have received congratulations from the Office of the Commanding General, U.S.A. Army Services of Supply, for plating services we have rendered, details of which cannot be sent through the post. All formulae for this work were derived from *Metal Finishing* pages.

Wishing you all the best, we remain,

Yours truly,  
BURROW'S PLATING WORKS.  
(Signed) R. Burrows





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BETTER MATERIAL, ANYWAY!**

#### **WHAT ARE THE TYGONS?**

*The Tygons are synthetic materials resembling rubber in many physical properties. They are characterized by a remarkable resistance to chemical attack, and by wide flexibility in their range of application. The Tygons are made in flexible, semi-rigid or rigid sheets; in the form of molded or extruded parts, tubes, and rods; and are placed into solution for use as a corrosion-resistant paint or for impregnation of porous materials.*



Have you tried Tygon  
Tempo-rec, the  
easily applied, easily  
removed masking  
material for hard  
chromium plating?  
Write for literature  
and samples.

**RIGHT!** Tygon *is* a better lining material for most pickle and plating tanks. Tygon looks like rubber, feels like rubber, but does things rubber never could do. For instance, Tygon will handle any pickle or plating solution—even the chromic acid solutions used in hard chromium plating. Again, Tygon is unaffected by active oxidizing agents — will not deteriorate with age. Tygon is a non-conductor, with a dielectric strength equal to that of rubber. If you need a new tank, by all means specify that it must be lined with Tygon. You'll save rubber for war, and you'll get a better, more durable tank lining.



**U. S. STONEWARE**  
AKRON, OHIO

IN CANADA: CHAMBERLAIN ENGINEERING, LTD., MONTREAL

ENGINEERS, MANUFACTURERS, DISTRIBUTORS OF CORROSION-RESISTANT  
EQUIPMENT FROM METALS, CERAMICS, RUBBER, AND SYNTHETICS